Do the Psychological Effects of Ongoing Adversity in a Natural Context Accumulate or Lessen over Time? The Case of the Canterbury Earthquakes

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ABSTRACT

The current study examined the psychological effects of recurring earthquake aftershocks in the city of Christchurch, New Zealand, which began in September 2010. Although it has been identified that exposure to ongoing adverse events such as continuing terrorist attacks generally leads to the development of increasing symptomology over time, differences in perceived controllability and blame between man-made and natural adverse events may contribute to differences in symptom trajectories. Residents of two Christchurch suburbs differentially affected by the earthquakes (N = 128) were assessed on measures of acute stress disorder, generalised anxiety, and depression, at two time points approximately 4-5 months apart, in order to determine whether symptoms intensified or declined over time in the face of ongoing aftershocks. At time 1, clinically significant levels of acute stress were identified in both suburbs, whereas clinical elevations in depression and anxiety were only evident in the most affected suburb. By time 2, both suburbs had fallen below the clinical range on all three symptom types, identifying a pattern of habituation to the aftershocks. Acute stress symptoms at time 2 were the most highly associated with the aftershocks, compared to symptoms of generalised anxiety and depression which were identified by participant reports to be more likely associated with other earthquake-related factors, such as insurance troubles and less frequent socialisation. The finding that exposure to ongoing earthquake aftershocks leads to a decline in symptoms over time may have important implications for the assessment of traumatic stress-related disorders, and provision of services following natural, as compared to man-made, adverse events.

CHAPTER ONE

INTRODUCTION

1.1 Overview

When individuals are exposed to potentially life threatening situations, a common response is to react with intense fear and helplessness (Smith & Rauch, 2010). In the initial period after exposure to a stressor, individuals may experience dissociative symptoms, re-experiencing of the event, and hyperarousal to, and avoidance of, stimuli associated with the adverse event, defined as Acute Stress Disorder (ASD; Bryant, 2006). However, these symptoms generally diminish over time, not lasting more than one month. Yet in a relatively small percentage of cases these symptoms persist, whereby a diagnosis of Post Traumatic Stress Disorder (PTSD) might best explain the pattern. In this instance, the symptoms mentioned above, excluding dissociative symptoms, will last for at least one month, and cause significant impairment in daily function. Other symptoms, such as those of depression and anxiety, may also be present in the initial stages after a life-threatening event (Galea et al., 2007; Goenjian et al., 2000; Goenjian et al., 2001; Paranjothy et al., 2011; Roussos et al., 2005; Sastry & VanLandingham, 2009; Thienkrua et al., 2006; van Griensven et al., 2006) and these too may only become intrusive and chronic for the minority of individuals.

Much research has examined vulnerability factors for post traumatic disorders. This work has explored demographic and psychological factors, and has largely found that previous mental health status, income, education, gender, age and ethnicity may all contribute to the risk of psychopathology following a life stressor (Kilic & Ulusoy, 2003; Lai, Chang, Connor, Lee, & Davidson, 2004; Yang et al., 2003; Kumar et al., 2007; Chen et al., 2007;

Garrison et al., 1995; Thienkrua et al., 2006; Kun et al., 2009). Factors related to the stressor itself may also increase vulnerability, such as the loss of a loved one, home, or job, or the experience of injury as a consequence of the event (Kun et al., 2009; Hsu, Chong, Yang, & Yen, 2002; Demir et al., 2010; Kumar et al., 2007; Goenjian et al., 2001; Thienkrua et al., 2006; Paranjothy et al., 2011; Sastry & VanLandingham, 2009; Chen et al., 2007; Kolaitis et al., 2003; Cao, McFarlane, & Klimidis, 2003; Bulut, Bulut, & Tayli, 2005; Wang et al., 2000; Galea et al., 2007; Kilic & Ulosoy, 2003; Roussos et al., 2005). Amongst this research, a "dose exposure" pattern of symptomology can be found, whereby those who are exposed to higher levels of trauma, such as the loss of a loved one or experience of injury, generally show higher levels of symptoms in the aftermath of the event.

The literature surrounding psychological distress following potentially life threatening stressors is based around both man-made adverse events (e.g. physical and sexual assault, car accidents, war and combat) and natural disasters. Additionally, some research has focused on the effects of ongoing adversity such as ongoing terrorist attacks (Bleich, Gelkopt, Melamed & Solomon, 2006; Hobfoll et al., 2009; Rossman, 2001); however there is very little research on the effects of ongoing natural disasters. It is important to examine closely the effects of ongoing exposure to stressors, as symptoms of acute stress may be re-triggered and exacerbated with each exposure to the stressor through a strengthening of fear structures associated with the event (Adessky & Freeman, 2005). In this case, a larger group of individuals may be affected. With a single adverse event, symptoms generally disappear as time since exposure to the stressor increases. Consistent with the research showing a "dose exposure" pattern of symptomology following a traumatic event, it could be expected that being exposed to adverse events over a long period of time would produce higher levels of symptomology.

Longitudinal studies examining the effects of long term exposure to man-made adverse events, such as war and terrorism, have identified a pattern of accumulation, whereby individuals develop increased stress over time as a result of the reoccurrence of adverse events, to be the most likely course for symptoms (Bleich et al., 2006; Hobfoll et al., 2009; Rossman, 2001). However, other longitudinal studies, as well as those looking at the effects of single versus multiple experiences of traumatic events, have shown that symptoms may actually decrease with each exposure to a stressor (Bleich et al., 2006; Amir & Sol, 1999). In this case, individuals may experience a decrease in symptomology over time as they become used to the stressor, a process called habituation. Furthermore, due to differences between man-made and natural stressors, it is unknown whether the impact of accumulation operates in the instance of ongoing natural adverse events.

One instance of ongoing natural adversity is the presence of aftershocks for long periods of time after a major earthquake. The current study will look specifically at the case of ongoing aftershocks in Christchurch, New Zealand, after it was exposed to several major earthquakes (e.g. September 2010; February 2011; June 2011; December 2011) and ongoing aftershocks. This chapter will provide a review of the relevant literature, as well as introduce the two models which will provide a conceptual framework for the current study. Limitations of the available research on the effects of ongoing adversity will be described, and will provide a basis for the current study. This study may also offer important implications for diagnostic nomenclature and service provision, which will be discussed later.

1.2 Psychological distress following natural disasters

Numerous studies have documented the effects that natural disasters may have on psychological wellbeing. One of the most common and well documented responses to traumatic events such as natural disasters is PTSD (Neria, Nandi, & Galea, 2008). Its acute form, ASD, is common in the earlier phases, and is identified largely by the presence of dissociation symptoms (Bryant, 2006; Cardena & Carlson, 2011). Nonetheless, symptoms of other major psychological disorders may also be present in the aftermath of a natural disaster, such as those of generalised anxiety, or depression (Goenjian et al., 2000; Goenjian et al., 2001; Goenjian et al., 2009; Thienkrua et al., 2006; Paranjothy et al., 2011; Galea et al., 2007; Roussos et al., 2005; van Griensven et al., 2006). This section will review the contribution natural disasters can have on the development of psychological disorders.

1.2.1 Acute Stress Disorder

In order to help distinguish which individuals are likely to progress to PTSD four weeks after a traumatic event, and therefore allow for early interventions, the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV), introduced the diagnosis of ASD (Cardena & Carlson, 2011). ASD refers to the PTSD symptoms of re-experiencing, avoidance of stimuli associated with the event, and increased arousal from two days to one month following a trauma. However, unlike PTSD, ASD also includes the presence of dissociative symptoms. It is thought that the presence of dissociative symptoms in the early phase results in encoding difficulties at the time of trauma and fragmented memories, which then leads to later deficits in processing of traumatic memories and adaptation to traumatic stress (Bryant, 2006). Research has shown however that ASD may not be an especially effective predictor of PTSD and therefore its predictive validity may be limited. For example, although approximately 75% of those who initially have symptoms of ASD go on to develop

PTSD, around half of those with PTSD do not have initial ASD symptoms (Bryant, 2006; Mills, Edmondson, & Park, 2007).

ASD is a common phenomenon following natural disasters. In a series of studies by Sattler et al. (2006), both a community sample and a university sample were shown to have symptoms of ASD after three major earthquakes in El Salvador. The dominant symptoms were sleeping difficulties, becoming easily upset and/or angry, feelings of anxiety, avoiding talking about things that reminded participants of the earthquake, feeling that time was standing still, and feelings of disorientation. Factors associated with the level of symptomology included level of damage, loss of resources, and low social support, as well as female gender.

Cardena and Spiegel (1993) looked specifically at the dissociative symptoms characteristic of ASD in a study of the 1989 San Francisco earthquake. They examined dissociative and anxiety symptoms at one week post-quake, and four months after the event, in a group of students at two different institutions. Interestingly, it was found that alterations in cognition and memory, along with other dissociative phenomena, were more strongly related to the traumatic event than symptoms of anxiety. Symptoms of dissociation were much more prevalent in the week following the earthquake than at the four month follow up, characteristic of an ASD diagnosis.

Mills et al. (2007) explored trauma and stress responses among Hurricane Katrina evacuees. Using the Acute Stress Disorder Scale (ASDS), 62% of the sample met the ASD threshold criterion in days 12 to 19 after the hurricane. This finding shows that the prevalence of ASD is often extremely high in those experiencing natural stressors. Common predictors of ASD in this sample included female gender, injury, decreased perceived control over the present, and psychiatric history. Interestingly, all of these contributors have also shown to be

related to PTSD, which highlights the potential for ASD to develop into PTSD over time (Mills et al., 2007).

In comparison, Bergiannaki, Psarros, Varsou, Paparrigopoulos, & Soldatos (2003) investigated the ICD-10 (International Classification of Diseases and Related Health Problems, 10th Revision) diagnosis of Acute Stress Reaction (ASR) in those exposed to the 1995 earthquake in Greece. The criteria for ASR, in comparison to ASD, include physical symptoms and autonomic arousal symptoms associated with fear, and a diagnosis is not made beyond the initial 48 hour period after the event. Seventy percent of the sample in this study met ICD-10 criteria for ASR within the first 48 hour period after the earthquake. However, symptoms of ASR diminished in only 10% of the sample, and persisted beyond the 48 hour period in 60%, becoming what Bergiannaki et al. (2003) describe as Protracted Acute Stress Reaction (PASR). Despite covering a broader range of symptoms than an ASD diagnosis, the PASR diagnosis is comparable to that of ASD, including symptoms of dissociation. This study therefore supports that a high number of people exposed to such an event are likely to experience symptoms of ASD in the month following.

1.2.2 Post Traumatic Stress Disorder

To be diagnosed with PTSD, individuals must have been exposed to an event involving risk of serious injury or death to self or others, and a response to the event involving intense fear, horror, or helplessness (Smith & Rauch, 2010). At least one symptom of re-experiencing of the event must be present, along with three symptoms of avoidance (e.g., of stimuli associated with the event, emotional numbing) and two of arousal (e.g., sleep disturbance). These symptoms must be present for at least one month after the event (Smith & Rauch, 2010). Significant impairment in major domains of everyday life is also required for a diagnosis of PTSD (Bisson, 2007).

The literature available on PTSD following natural disasters is variable, with the vast majority focusing on PTSD in children and adolescents, rather than adults. Largely, PTSD rates have been shown to be higher in children and adolescents than in adults (Parvaresh & Bahramnezhad, 2009; Kolaitis et al., 2003; Demir et al., 2010; Bal & Jensen, 2007; Giannopoulou et al., 2006; Goenjian et al., 2001). In adults, the rate of PTSD following natural disasters is lower than that after other types of disasters (e.g., man-made, technological) according to a review by Neria et al. (2008). With natural disasters, the prevalence of PTSD responses ranges dramatically from 3.7% to 60% (Neria et al., 2008), and this variance can be largely accounted for by the methodology of the study and the sample used. For example, several studies have examined the differences between those living closer to the affected areas, and those living further away (Galea et al., 2007; Kilic & Ulosoy, 2003; Wang et al., 2000; Thienkrua et al., 2006; Bulut et al., 2005), and in most cases found that those living in closer proximity to the disaster zone experienced higher rates of PTSD. Other factors which have lead to variable findings of PTSD rates include time since the event, the measures used, and population differences, for example, those exposed to floods in England (Paranjothy et al., 2011), largely an affluent country, would be generally less vulnerable than those exposed to the El Salvador earthquakes (Sattler et al., 2006).

Galea et al. (2007) have found high rates of PTSD after Hurricane Katrina. Residents of the New Orleans metropolitan area, which was directly affected, were estimated to have a 30.3% prevalence of PTSD 30 days after the hurricane, and those in the less affected areas outside of New Orleans still had a 12.5% prevalence rate of PTSD. A study of the Wenchuan earthquake in China, conducted 2.5 months post-quake, found an even higher PTSD prevalence, reaching almost 50% (Kun et al., 2009). Kilic and Ulosoy (2003) have shown that even after long periods of time, natural disasters may still produce post-traumatic effects. For

example, in their study, it was shown that 18 months after the 1999 Turkey earthquakes, rates of PTSD were still high, specifically, 18.6% 45km away from the epicentre, and 41.9% at the epicentre. Similarly, Altindag, Ozen, and Sir (2005) reported a PTSD rate of 23% within 13 months of the 1999 Turkey earthquakes, whereas at only one month after the earthquake, rates were much higher (42%). In a United Kingdom (UK) sample exposed to the floods of 2007, PTSD was estimated to be prevalent at a rate of around 22%; however this was only significant in those who reported flood water in their homes (Paranjothy et al., 2011).

Other studies however have reported much less significant findings. For example, studies of the Taiwan earthquake of 1999 have found that rates of PTSD approximated 10-11% in a primary care clinic setting (Lai et al., 2004; Yang et al., 2003). However, both of these studies found higher rates of sub threshold PTSD, 32.0% and 19.0%, respectively. Similarly, Garrison et al. (1995) found that after Hurricane Andrew, although most participants reported some symptoms of post traumatic stress, less than 10% met the full criteria for the disorder. Two months after the December 2004 tsunami in south-east Asia, Kumar et al. (2007) surveyed adults in an affected coastal village of India. They found a slightly higher rate of PTSD (12.7%), which was more frequent amongst those injured during the tsunami, those with lower income, and women. The most common PTSD symptoms reported were recurrent thoughts and sleep disturbances. Another tsunami study conducted in Thailand by Van Griensven et al. (2006) found similar results, with symptoms of PTSD in 12% of those who had been displaced by the tsunami and only 7% of those whom were not displaced, measured at eight weeks post-tsunami. By nine months post-disaster, the rate of PTSD was much lower, equalling 7% in the displaced group and 2.3% in the non-displaced group. Rates of anxiety and depression were found to be much higher than those of PTSD at both time points. On the whole, discrepancies in methodology, such as populations studied

and length of time after the event in which data is collected, has meant that findings on PTSD after natural disasters are largely variable.

1.2.3 Anxiety

Whilst PTSD is currently categorised as an anxiety disorder in the DSM-IV, there is not a great amount of literature surrounding generalised anxiety following disasters. However, several of the studies mentioned above included anxiety and depression in their analysis, alongside PTSD. For example, Paranjothy et al. (2011) found that anxiety was high amongst those who reported flood water in their homes during the 2007 UK floods (48%). In those who did not experience flood water in the home, the rate of anxiety was only 5%. Additionally, anxiety was reported at a much higher rate than PTSD in this study. Similarly, Van Griensven et al. (2006) found rates of anxiety to be higher than PTSD in a sample affected by the 2006 tsunami in Thailand. Anxiety symptoms were reported by 37% of those who were displaced by the tsunami, and by 22-30% of those who were not displaced, depending on the city. Further research surrounding general anxiety, as opposed to PTSD in particular, as a response to natural disasters is warranted.

1.2.4 Depression

Depression also seems to be prevalent in the aftermath of natural disasters. Although some studies report PTSD at a higher rate than depression (Kilic & Ulosoy, 2003; Kilic et al., 2006), studies focusing on adult populations have nonetheless revealed high rates of depression. For example, Kilic and Ulosoy (2003) found a depression rate of 28.4% in a sample at the epicentre of the 1999 Turkey earthquake. Forty-five kilometres away from the epicentre the rate was 11.5%. Higher rates of depression closer to the epicentre may be associated with higher rates of injury and death to family and friends, which Cao et al. (2003)

found in their earthquake study of three groups located at differing distances from the epicentre. Given that depressive symptoms are often associated with grieving, it would not be surprising to find higher rates of depression in areas exposed to higher loss of life. Depression has also been linked to a lack of social support, and a study by Kilic et al. (2006) found high rates of depression in people who had relocated to a city approximately 300km away from the epicentre following the 1999 Turkey earthquake. While the PTSD rate in this study was even higher, this was not predicted by relocation after the event in contrast to depression, suggesting depression was possibly influenced by disruption to the social network (Kilic et al., 2006).

Other studies have reported that depression is often more prevalent than PTSD following natural disaster, even when loss of life and disruption to social support network is not a factor. For example, in the sample exposed to the UK floods, depression was as high as 43% in those who experienced flood water in the homes compared to a rate of PTSD at only 22%, and in those who did not experience flood water in the home the rate for depression was 7%, 5% higher than that for PTSD, however prevalence rates of depression prior to the event were unknown (Paranjothy et al., 2011). Similarly, Van Griensven et al. (2006) found a 30% rate of depression in a sample from a Thai city displaced by the 2006 tsunami, and even those who were not displaced by the tsunami had a depression rate of 21%. PTSD in comparison was only prevalent at rates of 12% in those displaced, and 7% in those who were not. Although the rates for both disorders had decreased by the nine month follow up, those with depression still outnumbered those with PTSD. Altindag et al. (2005) found that although PTSD seemed to subside over time, decreasing from 42% within one month after the 1999 Turkish earthquake to 23% within 13 months, there was no change in depression.

Overall these studies show that following natural disasters, depression is quite prevalent, and can follow a long course. Studies of children and adolescents have also suggested that depression may even be more common following natural disaster than PTSD, and that if it is neglected, has the potential to be long-lasting (Thienkrua et al., 2006; Roussos et al., 2005; Goenjian et al., 2009).

1.2.5 Relationships between different psychological disorders following disaster

It is relatively common for PTSD, anxiety and depression to inter-relate, and even co-occur simultaneously following natural disasters. In many of the studies focusing on psychological distress following natural disasters, it can be found that previous psychiatric disorders or mental health problems increase the risk for developing post-disaster psychopathology (e.g. Kilic & Ulosoy, 2003; Mills et al., 2007; Sattler et al., 2006). Mills et al. (2007), in a sample of Hurricane Katrina evacuees found that of those who suffered from an anxiety disorder prior to the event, 77.8% met the criteria for ASD after Katrina, and 71.4% of those who had previous history of depression met ASD criteria. However, of those who had no previous psychiatric history, the number who met criteria for ASD after Katrina was significantly lower, at 54.4% (Mills et al., 2007). Sattler et al. (2006) also described the relationship between ASD and depression, pointing out that in accordance with the diathesis-stress model, mental health problems prior to a traumatic event may increase the risk for other mental health problems.

Additionally, many studies have shown evidence for co-morbidity of different disorders following exposure to adverse events. For example, Lai et al. (2004) found that following the 1999 Taiwan earthquake, those who were identified as having either full or partial PTSD were more likely to have any other Axis I mental disorder, and in particular generalised anxiety disorder. Additionally, those who had full PTSD as opposed to partial

PTSD were more likely to have major depressive disorder. Likewise, Maes, Mylle, Delmeire, and Altamura (2000) found in their sample exposed to either fire or motor vehicle accident that 51% of those with PTSD had one or more additional Axis I diagnoses. Another study reports rates of co-morbid depression and PTSD to be as high as 79% in a sample exposed to Hurricane Mitch, only marginally lower than the rates of each disorder on its own (Goenjian et al., 2001). It is likely that co-morbid symptomology, such as depression and other anxiety disorders, may actually result from the experience of traumatic stress related symptomology (Sattler et al., 2006). Several studies have identified this pattern, for example finding that PTSD scores strongly predict variance in depression scores (Roussos et al., 2005; Kolaitis et al., 2003). It is possible that this relationship could include a third variable of trauma exposure, whereby those who have been exposed to a higher level of trauma may have experienced more losses and adversities which make one vulnerable for depression (Roussos et al., 2005). All in all, these findings show that following traumatic life events, symptoms of differing psychological disorders can interact and any one disorder should not be looked at in isolation.

1.3 Factors contributing to the development of psychopathology following natural disasters

Following a wide-scale natural disaster a vast number of people are affected, but only some go on to develop mental health problems. This section aims to identify factors which increase the likelihood for developing psychological symptoms after natural disasters, and includes demographic factors related to the individual themselves, as well as factors which may be associated with the adverse event.

1.3.1 Demographic factors

Certain demographic factors which increase vulnerability for mental illness following natural disaster have been observed in numerous studies. Previously mentioned, having a history of mental illness can increase vulnerability for developing mental health problems after exposure to an adverse event (Kilic & Ulosoy, 2003; Lai et al., 2004; Mills et al., 2007; Sattler et al., 2006). A combination of other demographic mental health predictors have also often been reported in studies of natural disasters, such as female gender (Kilic & Ulosoy, 2003; Lai et al., 2004; Yang et al., 2003; Kumar et al., 2007; Chen et al., 2007), old age (Yang et al., 2003; Garrison et al., 1995; Thienkrua et al., 2006; Chen et al., 2007), lower income (Kun et al., 2009; Kumar et al., 2007; Sastry & Van Landingham, 2007), lower education (Kilic & Ulosoy, 2003; Chen et al., 2007; Sastry & Van Landingham, 2007), and ethnic minority (Kun et al., 2009; Garrison et al., 1995; Mills et al., 2007; Sastry & Van Landingham, 2007). However these risk factors differ across psychological disorders and it is therefore hard to draw conclusions from these studies as to who is at risk for developing general mental health problems after natural disaster.

One study in particular has examined general mental health problems, as determined by having any DSM-IV anxiety or mood disorder, in a sample of residents displaced by Hurricane Katrina (Sastry & VanLandingham, 2009). It was found that those of ethnic minority were at higher risk for mental illness, specifically, almost one third of African-American participants (31%) and only 6% of European descent participants were identified as having probable serious mental illness. However, there were no differences in ethnic groups when it came to identifying moderate mental illness, with both groups approximating 20%. Sastry and Van Landingham (2009) have also confirmed that the majority of above mentioned risk factors contribute to general psychopathology, rather than predicting only

specific psychiatric disorders. For example, unemployment and low income contributed greatly to mental illness, with only 11% of those who were unemployed not presenting with mental illness, whereas 39% were identified as having severe mental illness, and almost half had at least moderate mental illness. Additionally, it was found that the lower the income amongst the sample, the higher the likelihood of severe mental illness. Furthermore, the study observed an effect of education, with rates of moderate and severe mental illness approximately twice as high in those who had only a high school qualification or less, compared to those who had education further than high school. Overall the study confirmed that lower education, lower income, and ethnic minority are likely to contribute to vulnerability for mental illness following a natural disaster; however findings from other studies suggesting old age and female gender may also contribute, were not supported.

1.3.2 Event-related factors

Specific factors relating directly to the event itself may also contribute to psychological distress following natural disaster. As previously mentioned, many studies focusing on psychological distress following natural disasters have found a 'dose exposure' pattern of symptomology. For example, Kun et al. (2009) found individuals exposed to the 2008 Wenchuan earthquake who had experienced a loss within the family were more than 4.5 times more likely to display PTSD symptoms than those who had not. Numerous other studies have found similar results regarding the association between PTSD and loss of a family member or friend in a natural disaster (Hsu et al., 2002; Demir et al., 2010; Kumar et al., 2007; Armenian et al., 2000; Kilic & Ulosoy, 2003; Kun et al., 2009; Parvaresh & Bahramnezhad, 2009), and have suggested that the closer the participant to the lost family member, the higher the likelihood for PTSD (Parvaresh & Bahramnezhad, 2009). Depression has also been associated with loss of a loved one to natural disaster (Goenjian et al., 2001);

however, it is not uncommon for individuals to experience depression and grief after such loss. Many studies have found that even having fear for one's own life or the life of a family member in the occurrence of an adverse event is likely to lead to depression or PTSD (Theinkrua et al., 2006; Mills et al., 2007; Giannopoulou et al., 2006; Kilic & Ulosoy, 2003; Livanou et al., 2005).

Other factors related to the event have also shown to contribute to psychological disorders. Damage to property, as determined by flood water in the home, was shown in the sample exposed to the UK floods of 2007 to affect rates of depression and PTSD (Paranjothy et al., 2011). Similarly, Sastry and Van Landingham (2009) found that those whose homes were badly damaged or destroyed by Hurricane Katrina had high rates of both moderate (23%) and severe mental illness (27%) compared to those whose homes were not damaged, or were damaged but still habitable, with more than 80% having no form of mental illness. Those who lost their homes were more than six times as likely to have a mental illness, and mental illness was more severe in those who had lost their home compared to those who had not. Property damage has also been identified as a contributing factor to psychopathology in several other studies, including another looking at a sample of New Orleans residents after Hurricane Katrina (Galea et al., 2007), and several earthquake studies including the Wenchuan earthquake in China (Kun et al., 2009) and the 1999 Taiwanese earthquake (Chen et al., 2001). Chen et al. (2007) found that those who experienced complete destruction of property as opposed to partial destruction in the 1999 Taiwan earthquake had significantly elevated risk for PTSD.

Sustaining injury in a natural disaster has also shown to lead to higher rates of psychopathology following the event (Galea et al., 2007; Altindag et al., 2005; Kolaitis et al., 2003; Parvaresh & Bahramnezhad, 2009; Hsu et al., 2002; Kumar et al., 2007). For example,

one year after the 1999 Turkish earthquake, 75% of the participants who had experienced earthquake-related injuries had PTSD, compared to only 39% of those who did not sustain any injuries (Altindag et al., 2005). Kumar et al. (2007) also reported that those who had experienced an injury as a result of the 2004 tsunami were almost three times as likely to display PTSD symptoms as those not injured. Similar findings have been reported in studies of children and adolescents (Hsu et al., 2002; Kolaitis et al., 2003). All of the above findings could be related to the idea that having fear for one's own life or the life of a family member during an adverse event is associated with both PTSD and depression (Thienkrua et al., 2006).

Another event-related factor which has shown to affect people's psychological responses, particularly to earthquakes, is proximity to the epicentre or the region which was most affected by the natural disaster. Many studies mentioned throughout this work have used proximity as a basis for determining one's exposure level (Cao et al., 2003; Bulut et al., 2005; Wang et al., 2000; Galea et al., 2007; Kilic & Ulosoy, 2003; Roussos et al., 2005). Although trauma exposure can vary depending where one lives (e.g., someone in a non-affected area may still have lost a close relative) proximity has generally provided an accurate determination of exposure and produced significant results. This may be due to higher levels of property damage and likelihood of injuries or death in areas that are most affected. Cao et al. (2003) found in their study of the 1988 Yun Nan earthquake in China that rates of psychiatric illness determined by the General Health Questionnaire (GHQ) were correlated with the distance of the town from the epicentre of the earthquake. Specifically, they observed the rates of psychopathology in three towns at differing distances from the epicentre of the earthquake, and found rates of 60.4% (20km away), 48.2% (37km away), and 44% (62km away), compared to a group which was not exposed at all (36.2% - 520km away).

Notably, residents of the town closest to the epicentre reported significantly higher rates of injury or death to family and friends, as well as higher accounts of property loss. This shows the importance of proximity in providing a good account of level of symptoms following traumatic exposure. Wang et al. (2000) however found that the level of social support individuals receive after a natural disaster can impact their reaction to the event. In comparing two villages at differing distances from the epicentre of the 1998 Hebei province (China) earthquake, they found that the closer village actually had lower rates of PTSD at three and nine months post-quake, which was attributable to a higher level of social support offered to the more affected areas. Generally however, proximity has provided a relatively good measure of the level of destruction and associated psychological distress following earthquakes.

In summary, the higher the level of trauma one experiences, the more vulnerable they typically are to developing post-event psychopathology. This was shown in the case of death of relatives and friends, serious injury to the self or others, and in the case of property damage. Additionally, studies looking at proximity to earthquake epicentres have also reported results consistent with the dose exposure pattern. However, length of time exposed to the event has not yet been used as a measure of exposure in the case of natural disasters. Assuming that being exposed to an adverse situation for extended periods of time could produce the same dose exposure effect as other factors on psychological health; this may be an area worthy of study.

1.4 Theories of ongoing exposure to trauma in the literature

There are few studies examining the effects of ongoing exposure to natural disaster. There are however, numerous studies examining the effects of ongoing man-made trauma. Much of the research is focused on war and terrorism, which may continue for many months or even years and can have damaging effects on not only those directly involved, but for the citizens of the regions affected. Overall, two main theories stand out in the literature on ongoing man-made adversity and the associated psychological effects. These are the accumulation and habituation theories.

1.4.1 Accumulation theory

Based on other research that has largely found that the higher the level of exposure to trauma the greater the symptomology, it could be argued that being exposed to adverse events for an extended period of time could have detrimental effects on psychological health. This has in fact been shown in several studies of ongoing man-made adversity (Hobfoll et al., 2009; Bleich et al., 2006; Rossman, 2001), and is known as a cumulative effect. The accumulation model of stress posits that repeated exposure to adverse events add up over time and produce a poor pattern of adjustment (Rossman, 2001). As a result of continued exposure to a stressor, symptoms may develop over time, or in those who already had symptoms initially, they may worsen. This has to some extent been shown in a study by Hobfoll et al. (2009) examining the trajectories of resilience, resistance, and distress amongst a sample exposed to terrorist attacks in Israel. The path that was observed in most participants (54%) was that of chronic traumatic stress (54%), whereby even after a year, participants did not show a reduction in symptomology. Additionally, it was found that 10.3% of the sample had developed symptoms at the follow up that were not initially present. In another study using a different sample exposed to the same terrorist attacks, it was found that traumatic

stress-related symptoms and the need for mental health treatment had increased since the sample was studied two years previous (Bleich et al., 2006). Furthermore, participants were less resilient after 44 months compared to 20 months, particularly in those with fewer resources, and were less optimistic about the future.

Ehlers and Clark (2000) have produced a framework which attempts to explain the cumulative effect of stress as a result of continuous adversity. They suggest that when individuals process an adverse event in a way that leads to a sense of serious current threat, as determined by excessive negative appraisal of the event and its consequences, then PTSD is likely to become persistent. In the case of ongoing adversity, for example the terrorist attacks of Israel, autobiographical memories are continuously being primed and are associated with each new attack. Related to this, Adessky and Freeman (2005) explain that fear structures associated with features of the adverse event are retrieved and reinforced when trauma-compatible information is presented. In the case of ongoing exposure to adverse events, fear structures are accessed and supported regularly, placing individuals at higher risk of developing PTSD.

Diamond, Lipsitz, Fajerman, and Rozenblat (2010) postulate a differential diagnosis for those who are exposed to ongoing traumatic exposure. These individuals, rather than following a typical path to PTSD which is determined by a specific event, do not report an event marking the onset of symptoms. Rather, they describe them as gradually increasing over time. In this case, symptoms are the cumulative result of repeated and ongoing stress, which Diamond et al. (2010) suggest should constitute a diagnosis of Ongoing Traumatic Stress Response (OTSR). People suffering from OTSR are more likely to experience avoidance and hyperarousal symptoms, however these are adaptive reactions based on reality and are likely to decrease or completely disappear when the stressor lessens or one is taken

away from the ‘stress-zone’. For example, people exposed to the ongoing terrorist attacks in Israel may tend to avoid going out to do the shopping or going to places where they are more likely to be exposed, and may experience exaggerated startle response to sounds reminiscent of another attack. In this instance, the primary distinction between OTSR and PTSD is that rather than being associated with traumatic memories which are coupled with past attacks, anxiety revolves around fear of future attacks. Although Diamond et al. (2010) distinguish OTSR from PTSD, the cumulative effects of ongoing adverse events can still make one vulnerable to PTSD. Additionally, impaired functioning, reduced quality of life, and increased life stressors associated with OTSR may also contribute to the development of other mental health problems, such as depression.

This section has so far focused on studies measuring the effects of repeated exposure to ongoing adverse events. However, the accumulation theory has also been supported by studies that show that the higher the number of adverse events one is exposed to throughout their lifetime the higher the likelihood for developing trauma-related disorders. This is another example of the dose-exposure effect. In a sample of 440 undergraduate psychology students, Vrana and Lauterbach (1994) examined the prevalence of negative life events and their association with psychopathology. Eighty-four percent of the sample had experienced at least one adverse event during their lifetime, and a third of the sample had experienced four or more adverse events. Rates of depression, anxiety, and PTSD were higher in those who had experienced more adverse events during their lifetime. In another study, Pimlott Kubiak (2005) found that in a sample of women from a disadvantaged social location, who were therefore more vulnerable to experiencing environmental stressors, PTSD was shown to increase by 40% with each adverse event. When a stressor was chronic, the likelihood of PTSD was even higher. Both PTSD and depression have been shown in many other studies to

be linearly associated with number of negative lifetime events, including in studies of adolescents (Suliman et al., 2009; Krupnick et al., 2004; Kolassa et al., 2010). Kolassa et al. (2010) also identified a pattern whereby those with a higher prevalence of trauma exposure have a lower probability of spontaneous remission from PTSD, along with higher lifetime symptom severity of PTSD shown in a dose-response pattern. Overall, the research on ongoing exposure to man-made adversity has shown that repeated or continuous exposure to such events is likely to have a negative impact on mental health.

1.4.2 Habituation theory

In contrast to the accumulation model, repeated exposure to trauma and adversity may have a habituation effect. The habituation model suggests that over time, people become less responsive to a stimulus repeatedly presented to them (Rossman, 2001; Jaycox, Foa & Morral, 1998). Therefore, instead of becoming more stressed as a result of continuing adversity, the habituation model proposes that the longer one is exposed the better the outcome. Bleich et al. (2006) describe habituation as a process which helps individuals learn to cope adaptively to an adverse situation over time. In their study, it was found that at a two-year follow up of an Israeli sample exposed to ongoing terrorist attacks, there was a higher need for mental health treatment, people were less optimistic about the future of their state, and resiliency had decreased over the two year period for those who had fewer resources; but overall participants had a greater sense of safety, reduced distress, and improved functioning, which could be explained by a habituation effect. Another study of an Israeli university sample examined the effects of the experience of single versus multiple adverse events (Amir & Sol, 1999). Here it was found that being exposed to one adverse event was associated with increased psychological distress, yet being exposed to multiple adverse events was associated with a reduction of distress. However, this study was cross-sectional rather than longitudinal,

and therefore care should be taken when interpreting its results. Overall, future longitudinal research on populations exposed to continuous adversity needs to be undertaken.

Despite the lack of research surrounding continuous adversity and the habituation theory, a well known and empirically supported treatment for PTSD is based on the habituation theory. Exposure therapy is a process whereby an individual with PTSD is confronted through imaginal or in-vivo experiences with people, places, or objects associated with the trauma. It is thought to operate by aiding habituation to memories and feelings associated with a traumatic event, as well as learning that fear may not always be associated with danger (Diamond et al., 2010; Jaycox, Foa & Morral, 1998).

1.5 Limitations of previous literature on the effects of ongoing exposure to adversity

Whilst previous research examining the effects of continuous exposure to adversity and the experience of multiple traumatic events has been valuable in determining whether symptoms follow a pattern of accumulation or decline over time, certain limitations are evident. These limitations will be discussed in this section, and could explain inconsistencies in findings, as well as a justification for the present study which addresses these limitations.

1.5.1 Research on continuous exposure to natural stressors

Little research has examined the effects of repeated exposure to a natural stressor, although there is some research of the effects of ongoing adverse conditions as a result of a single natural disaster following Hurricane Katrina (Galea et al., 2007). Although most natural disasters represent a single event, often after a major earthquake aftershocks can continue for long periods of time. Considering that earthquakes are a relatively common worldwide natural event, it is surprising that the effect of long term exposure to aftershocks

has not yet been studied. Symptoms resulting from ongoing exposure to natural adversity may follow a different course to man-made events. Important distinctions between natural and man-made adversity are evident, and justify the need to study natural stressors in an ongoing context.

Largely, there are major differences in the perceived controllability and blame one may associate with these different types of events, which may contribute to their effects (Bodvarsdottir & Elklit, 2004). Larsen and Fitzgerald (2010) found in their study of sexual harassment that blame was positively related to PTSD symptoms. Additionally, Greening, Stoppelbein, and Docter (2002) explain that individuals exposed to negative life events who take on an attributional style whereby negative outcomes are attributed to internal, stable and global causes, are generally at a higher risk for developing psychopathological symptoms, particularly depression. Although the actual occurrence of man-made adversity, such as rape, is not directly controllable, there may be some controllability over risk for the event, for example a person who regularly walks alone at night in poorly lit areas may be at a higher risk for assault (Bodvarsdottir & Elklit, 2004; Brun, 1992). In this instance, an individual may be more likely to blame oneself, and experience higher levels of PTSD symptoms.

However, in the case of natural disasters, due to the lack of human controllability it would be rare for individuals to attribute the causes to themselves or anyone else (Bodvarsdottir & Elklit, 2004; Greening et al., 2002). All the same, Greening et al. (2002) state that those who show a tendency towards ascribing to a pessimistic explanatory style may indeed attribute their experience of the event internally, thus increasing their risk for post-disaster adjustment problems. Additionally, a review by Massad and Hulsey (2006) revealed that self-blame may in fact be associated with natural disasters. In contrast, Kushner, Riggs, Foa and Miller (1992) found that the more one felt in control of all adverse events in

general the less fear they associated with the index event, and general psychopathology as well as state and trait anxiety, were lower. In a natural disaster, it is less likely that an event will be perceived as controllable, and therefore in this case symptomology is likely to be higher. Although findings are variable, it is clear there are differences in perceived controllability and blame between natural and man-made adverse events.

Interestingly, a review by Neria et al. (2008) has in fact shown that PTSD rates differ between natural and man-made disasters. Specifically, following a man-made disaster (or technological disaster), rates of PTSD are higher than those following a natural disaster. This supports the above statements of Greening et al. (2002) whereby internal attributions are less likely after natural disaster due to uncontrollable causes, and as a result the likelihood for developing psychopathology is lower. To conclude, the literature suggests a difference in the psychopathology following natural and man-made disasters. Thus, there is a need for research which explores the effects of ongoing natural disasters, such as earthquakes.

1.5.2 Questions regarding generalizability of research across countries

Much of the research described so far in this literature review has been based in underdeveloped countries, which Canetti et al. (2010) suggest may be more likely to experience serious consequences and be at increased vulnerability for PTSD. This is due to a further depletion of already low economic conditions, education and social services, government functioning, resources, and industry. Wang et al. (2000) report that people in less developed countries throughout the world are also more likely to be affected by natural disasters and the percentage of people who die as a result of natural and industrial disasters is higher in these countries. In addition, Kilic and Ulusoy (2003) report a disparity between developed countries with higher resources, and developing countries, in terms of the level of psychological distress in survivors. Furthermore, symptoms of psychological distress may be

represented differently across different economic levels and ethnicities, for example, somatic expressions of psychopathology have been seen more commonly in underdeveloped countries (Wang et al., 2000). In general, reports of long term psychological distress in underdeveloped countries may not be representative of other populations exposed to ongoing adversity, and even within developed countries, individuals who come from poorer backgrounds with lower income, education and other resources, generally have a worse outcome following disaster.

Moreover, the research outlined in this literature review on ongoing exposure to adversity, which is of most interest to this study, has focused on only one type of adverse event (terrorist attacks) in only one country. It is unlikely that findings based on Israeli studies of the effects of ongoing terrorist attacks will generalise to all populations exposed to ongoing adversity, and in particular, ongoing natural adversity. So, due to a paucity of research in various developed countries following natural disaster, and particularly long term exposure to natural adversity, further research needs to be undertaken

1.6 Summary

Although much research has been conducted on the psychological effects of natural disasters, there is little research examining the effects of long term exposure to adverse natural conditions. After a major earthquake, often many aftershocks occur which can continue for long periods of time, providing a constant reminder of the initial event and leaving those in the surrounding areas fearful of another large tremor. Research on natural disasters has identified risk factors which are associated with the event, and have largely suggested a dose-exposure pattern of symptomology whereby those exposed to higher levels

of trauma are more vulnerable to psychopathology following such events. For example, those who live in closer proximity to a disaster zone are more at risk of experiencing psychological distress as a consequence, as are those who may have been injured or lost a loved one in the disaster. In accordance with the dose-exposure pattern of symptomology it could be assumed that being repeatedly exposed to ongoing natural adversity, such as earthquake aftershocks, over a long period of time could be harmful.

Research conducted in countries exposed to ongoing terrorist attacks has suggested that after being exposed to such adversity for long periods of time, individuals may gradually develop symptoms which were not initially present, or in those that were, symptoms may worsen (Hobfoll et al., 2009; Bleich et al., 2006; Rossman, 2001). This is due to an accumulation effect, where over time the stress associated with such attacks can build up to produce poor mental health. However, there has been other research which has suggested symptoms may actually decline over time, as individuals learn to cope with the ongoing stress (Bleich et al., 2006; Amir & Sol, 1999).

Additionally, although the research findings seem to point more towards an accumulation effect, it is important to distinguish between natural disasters and man-made events, such as terrorist attacks. Differences in blame and perceived controllability mean that the psychological effects of man-made and natural adverse events may differ, with it being suggested that psychopathology may be lower following a natural disaster (Neria et al., 2008).

Furthermore, the current research on long term exposure to adversity is largely conducted in underdeveloped countries. Since these countries have been identified as being more vulnerable to a poor outcome after disaster (Canetti et al., 2010), the results of these studies may not be generalizable to more developed countries. Thus, there is a need for

further research which specifically examines the effects of long term exposure to ongoing natural adversity, such as earthquake aftershocks, and in developed countries.

1.7 The present study

The present study investigated the effects of ongoing aftershocks as the result of major earthquakes in Christchurch, New Zealand. The first earthquake struck outside of the city in the early hours of September 4th 2010, measuring 7.1 on the Richter scale. After thousands of smaller aftershocks, the city was struck by another significant earthquake, measuring 6.3, on the 22nd February 2011, 12.51pm. This earthquake was at a shallower depth and closer to the city, producing a significant impact and widespread damage. The February earthquake resulted in the death of 181 people with the collapse of many central city buildings, and resulted in substantial injuries of others and detrimental effects for many. Aftershocks have since continued, with some of sizeable magnitude (including another 6.3 on the 13th June, 2011, and a 5.9 on the 23rd December, 2011) triggering memories of the earlier, more devastating earthquakes, as well as causing more physical damage. These aftershocks provide an opportunity to study the case of ongoing adversity in a natural context which has not before been examined.

The aim of the current research is to identify whether the accumulation or habituation theory holds for the effects of ongoing earthquakes in the Christchurch region. Specifically, do the psychological effects of aftershocks lessen over time as people learn to cope adaptively, or does the continual stress of these ongoing aftershocks accumulate to worsen symptoms over time? The current study involved collecting measures of generalised anxiety, depression, and acute stress disorder at two time points to identify whether after several

months exposed to aftershocks there was a change in symptomology and if so in what direction. Using two differentially affected suburbs of Christchurch, matched for demographics, the current study will allow distinction of whether those in more severely affected areas experience different changes over time than those in less affected areas.

As well as providing data on the effects of reoccurring natural events, specifically earthquake aftershocks, on psychological health, the current study may have important implications for service provision, as well as to future diagnostic criteria for post-traumatic stress related disorders. These will be discussed later. Overall, it was hypothesised based on the dose exposure pattern of symptomology reported in other natural disaster studies that repeated exposure to ongoing aftershocks will worsen symptomology. If this is found true, the accumulation model of stress shown in studies of man-made trauma will be supported.

CHAPTER TWO

METHOD

2.1 Sampling

Participants were drawn from two Christchurch suburbs (Mount Pleasant and Cashmere West) – one experiencing significant earthquake damage, and one experiencing relatively less earthquake-related damage. Using the 2006 New Zealand Census of Population and Dwellings data (http://www.stats.govt.nz/Census/2006CensusHomePage.aspx), both suburbs were matched on demographic and socio-economic factors, including income (Mount Pleasant median income = $34,000; Cashmere West median income = $33,200), gender (Mount Pleasant = 48.4% male; Cashmere West = 48.5% male), ethnicity (Mount Pleasant 84.1% European; Cashmere West 85.1% European; both with less than 3% Maori, and less than 3% Asian), unemployment (Mount Pleasant = 2.8%; Cashmere West = 2.5%), and education (approximately 57% aged 15 and over have a post-school qualification and approximately 12% with no formal qualification for both suburbs).

Mount Pleasant, a hillside suburb close to the sea, south-east of the city, was severely affected due to its close proximity to the Port Hills fault line and the epicentres of the February and June earthquakes. In both February and June 2011, Mount Pleasant encountered substantial damage to housing and other infrastructure such as roads, sewage, electricity, and water, and many people living in this area lost their homes. In comparison, Cashmere West, situated further west around the hills to the south of Christchurch and almost twice the distance from the epicentres, encountered significantly less damage. Although some homes

were damaged or destroyed, the damage across the suburb was much less widespread and severe.

For each of the two suburbs, the main residential street was chosen based on the boundary maps provided by the 2006 Census data. In Mount Pleasant, the main residential street was Mount Pleasant Rd, and in Cashmere West this was Hackthorne Rd. Households in both of these streets were sampled, beginning at the lowest street numbers. However, particularly in Mount Pleasant, due to the large amount of now uninhabited residences, subsidiary streets were also sampled as to complete data collection. In each household, whoever answered the door, if over the age of 18 years and agreeable to participate in the study, was interviewed. No more than one person per household participated.

2.1.2 Participants

The final sample included 62 participants from Mount Pleasant and 66 participants from Cashmere West. Of the initial sample of 100 participants in each of the two suburbs, one participant from Mount Pleasant and three participants from Cashmere West declined follow-up. Two participants from Mount Pleasant had moved away from Christchurch since time 1, and therefore decided not to be a part of the final sample. Ten participants from Mount Pleasant and seven participants from Cashmere West had agreed follow-up, but either did not show up to the scheduled appointment, or cancelled and were unable to be re-contacted. The remaining time 1 participants (25 from Mount Pleasant and 24 from Cashmere West) could not be contacted after several attempts, and therefore were also not followed-up. Of the final sample, the two suburbs did not differ in terms of mean age (Mount Pleasant: 55.03, SD = 15.75; Cashmere West: 53.06, SD = 13.21), $t(124) = 0.76$, $p = 0.45$, or gender (Mount Pleasant: male = 21, female = 41; Cashmere West: male = 18, female = 48), x^2 (1, N =128) = 0.66, $p = 0.42$.

2.2 Measures

This study utilised a survey which was developed for a larger community study containing a broad array of items (see Appendix C and G). Participants were assessed using three commonly utilised measures of anxiety, depression, and ASD. In addition to these measures, the survey contained items relating to responses to, and consequences of, the February 22nd earthquake and subsequent aftershocks. Participants were also asked general demographic questions such as age and gender. The measures of primary interest in this study are now described.

2.2.1 Acute Stress Disorder Scale (ASDS; Bryant, Moulds, & Guthrie, 2000)

The ASDS is a 19-item self-report scale used to measure ASD symptoms, as well as to help predict those who may go on to develop PTSD. The ASDS measures all four diagnostic symptom clusters of ASD symptoms – dissociation, re-experiencing, avoidance, and arousal. All items are rated on a 5-point Likert scale, with responses ranging from 'not at all' (1) to very much (5). The minimum total score is 19, and the maximum total score is 95. Bryant et al. (2000) examined sensitivity, specificity, predictive values, and effectiveness of five alternative cut-off scores, and found that an optimal cut-off score representing a diagnosis of ASD on the ASDS was 56. Mills et al. (2007) in their study of Hurricane Katrina evacuees report a mean ASDS score of 61.10 (SD = 19.23), with 62% of the total sample meeting ASD criteria in accordance to a cut-off score of 56. Also using this cut-off, 91% of those who developed PTSD and 93% of those whom did not, from a sample of households that were threatened by the Sydney and Hobart bushfires, were correctly identified (Bryant et al., 2000). However, 33% were falsely identified as being at risk of developing PTSD when in fact they did not go on to develop PTSD.

Other studies have also suggested that ASD may have limited success in predicting PTSD. For example, Bryant (2006) reports a study using a sample exposed to a typhoon, whereby only 30% of participants who initially met criteria for ASD met criteria for PTSD at an 8-month follow-up. Of the participants who met criteria for PTSD at 8-months, only 37% initially met ASD criteria. In a review by Isserlin, Zerach, and Solomon (2008), an analysis of numerous studies suggested that excluding the dissociation category on the ASDS may in fact increase the predictive value for PTSD. On the other hand, Bryant and Harvey (2000) have proposed an ASD classification system emphasising the importance of the dissociation cluster of symptoms in ASD, whereby patients must score a total of at least nine on the dissociation items of the ASDS, and at least 28 on the combined re-experiencing, avoidance, and arousal items. Much research, including both retrospective and prospective studies using samples exposed to many differing types of events, has shown that dissociative experiences such as derealisation, depersonalisation, and gaps in awareness, are associated with the development of PTSD (Cardena & Carlson, 2011). In addition, a meta-analysis of seven risk factors for PTSD found that peri-traumatic dissociation was the strongest predictor, $r = .35$ (Ozer, Best, & Lipsey, 2003).

In an attempt to explain the disparities in findings of the role of dissociation and ASD in predicting PTSD, Cardena and Carlson (2011) suggest that it may be the timing of the dissociation which plays a role in predicting PTSD. For example, dissociation at the time of trauma has shown to have little relationship with PTSD symptoms, but the presence of dissociative symptoms following a trauma is more likely to predict PTSD symptoms in the early stages after a trauma, and even two months after the event (Cardena & Carlson, 2011). Most studies fail to distinguish between dissociative experiences at the time of the trauma, and those in the days and weeks following, which could explain the variable results.

In the present study, a scale of acute stress was used as opposed to a scale of PTSD. Although a criterion of the diagnosis of ASD is that symptoms last for a maximum of four weeks and at the time of data collection it had been several months since the initial large earthquake which struck Christchurch in September 2010 and the major earthquake which struck in February 2011, a measure of ASD was chosen due to the persistent aftershocks. A measure of PTSD may not be appropriate for some people who may be most distressed by the common occurrence of persistent aftershocks at frequent but unpredictable intervals. In this case there is often not enough time between aftershocks for a diagnosis of PTSD to categorise one's distress. However for those who experience traumatic reactions as a response to the past major earthquake as opposed to the uncertainty of future aftershocks, the ASDS can also provide a relatively good measure of PTSD symptoms, and an indication of those who might go on to develop PTSD.

The ASDS has shown good internal consistency overall (Cronbach's $\alpha = .96$) and for each cluster of symptoms, with Cronbach's α of .84 for dissociation, .87 for re-experiencing, .92 for avoidance, and .93 for arousal (Bryant et al., 2000). The ASDS has also shown good test-retest reliability, with a correlation of .94 between two different assessments (Bryant et al., 2000). It also has reasonable convergent validity. That is, the re-experiencing, avoidance, and arousal clusters were found to be strongly correlated with relevant psychopathology measures (re-experiencing: correlation of .81 with Acute Stress Disorder Interview (ASDI) re-experiencing scale; avoidance: correlation of .79 with ASDI avoidance scale; correlation of .88 with Impact of Event Scale (IES) avoidance subscale; arousal: correlation of .80 with ASDI arousal scale). The dissociative cluster, however, did not correlate with the Dissociative Experiences Scale (Bryant et al., 2000). The ASDS also

possesses four-factor structure consistent with the DSM-IV symptom clusters of ASD (Wang, Li, Shi, Zhang, & Shen, 2010).

2.2.2 Patient Health Questionnaire 9-item Scale (PHQ-9; Kroenke, Spitzer, & Williams, 2001)

The PHQ-9 is a self report questionnaire used to screen and measure the severity of depression. It has nine items representing the nine DSM-IV criteria for a major depressive episode, which are rated on a 4-point Likert scale of occurrence, with responses ranging from 0 ("not at all") to 3 ("nearly every day"). Major depression is diagnosed if five or more of the nine depression symptoms have been present at least "more than half the days" over the previous two weeks (Kroenke et al., 2001). PHQ-9 total scores range from 0-27, whereby higher scores indicate a higher level of depression, and are calculated by summing the scores of the individual items. The PHQ-9 allows recognition of differing levels of depression, with a score of 5-9 suggesting mild depression, 10-14 moderate depression, 15-19 moderately severe depression, and a score above 20 suggesting severe depression (Kroenke et al., 2001). The PHQ-9 also includes an item which screens for the presence and duration of suicidal ideation.

Overall the PHQ-9 has been shown to possess high internal consistency, with a Cronbach's α of .89 (Kroenke et al., 2001). The PHQ-9 also possesses strong criterion validity, as shown by a Receiver Operating Characteristic (ROC) analysis in a study by Kroenke et al. (2001), whereby the area under the curve for the PHQ-9 in diagnosing major depression was found to be 0.95. This shows that the PHQ-9 is successful in discriminating between those with and without major depression. The PHQ-9 also has excellent construct validity as determined by a strong positive association between PHQ-9 scores and functional status, disability days, and symptom related difficulty (Kroenke et al., 2001). In a study by

Kroenke et al. (2001), 580 patients were interviewed by mental health professionals who were unaware of the patients' scores on the PHQ-9. For those who the mental health professionals suggested as having major depression, scores on the PHQ-9 averaged 17.1 (SD = 6.1), and for those who were identified as having no depressive disorder, scores on the PHQ-9 averaged 3.3 (SD = 3.8). Test-retest reliability of the PHQ-9 over 48 hours is also excellent (r = 0.84; Kroenke et al., 2001). The PHQ-9 has also shown external validity suggesting its reliability and validity as a measure of depression severity may generalise to a variety of settings (Kroenke et al., 2001).

2.2.3 Generalised Anxiety Disorder 7-item Scale (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006)

The GAD-7 is a self-report questionnaire used to screen for the presence, and measure the severity of, generalised anxiety disorder symptoms. It has seven items which are measured on a 4-point Likert scale with responses ranging from 0 ("not at all") to 3 ("nearly every day"), with higher scores representing a higher presentation of symptoms of anxiety. Overall assessment is based on the sum score. Total scores range between 0-21, with a score between 5-9 representing mild anxiety, 10-14 moderate anxiety, and 15 and above representing severe anxiety symptoms (Lowe et al., 2008).

The GAD-7 has been confirmed to have excellent internal consistency (Cronbach α = .92) as well as good test-retest reliability (0.83) and procedural validity (0.83), which refers to the degree to which a new diagnostic procedure produces results similar to the results of an established diagnostic procedure (Spitzer et al., 2006). The GAD-7 as a measure of chronicity of symptoms has shown good criterion validity using a cut-off of 10. For example, in a study by Spitzer et al. (2006), of those who had scores of 10 or greater, 96% had

symptoms for at least one month, and 67% had symptoms for at least six months. The GAD-7 also proves to be a good measure of generalised anxiety in that most patients with GAD (89%) had scores of 10 or greater, and 82% of those without had scores less than 10. Ruiz et al. (2011) report a high positive correlation (0.85) with the Hamilton Anxiety Scale (HAM-A), which suggests that the GAD-7 also possesses good construct validity. A positive correlation between GAD-7 score and visits to primary care (0.39) and specialty clinics (0.73) was also found (Ruiz et al., 2011). Spitzer et al. (2006) report similar findings, that greater scores on the GAD-7 were associated with an increase in disability days (0.27), health care use (0.22), and symptom-related difficulty (0.63). Ruiz et al. (2011) have also confirmed the predictive value of the GAD-7, specifically as an outcome measure of disability in primary care patients with GAD. Overall the GAD-7 has shown to be a reliable and valid measure of anxiety in the general population. It was used in the current study as an index of anxiety symptoms.

2.2.4 Other items of interest in this study

Of interest to the current research, were several single questions relating directly to the aftershocks. These were "how anxious do the aftershocks make you?"; "how on edge do you feel as a result of the aftershocks?"; "how well can you predict the response you will have to each aftershock?"; and "how much do you believe you can control your responses to these aftershocks?", and were measured on a 10-point scale, with 10 measuring the highest intensity. In addition to these, following the completion of each scale, participants were asked how much they attributed any reported difficulties to the aftershocks as opposed to the major earthquake events, such as the September, February and June earthquakes, using a 5-point scale ranging from not at all to completely.

2.3 Procedure

The study was conducted as a door-to-door survey, with participants interviewed in their own homes. After a brief introduction and description of the study and survey, those who initially consented were given an information sheet explaining the study (Appendix A). If the participant agreed to participate, they were given a consent form to sign, which included whether or not they were agreeable to follow-up 4-5 months later (Appendix B). Once the participants gave their consent, the researcher administered the survey, beginning with the ASDS, followed by the PHQ-9, the GAD-7, and lastly the demographic and other single item measures, by reading the items to the participant and recording their response. After the survey, participants were thanked for their participation and were offered information sheets regarding taking care of oneself and getting back to everyday life after the earthquake (Appendix H). Contact details of agencies providing free support and counselling were included on these sheets (also on the information sheet – see Appendix A). Overall, the process took approximately 20 minutes, however this varied with each participant. The survey was conducted at certain times during the day when people were more likely to be home. Monday, Tuesday, Wednesday, and Thursday late afternoons/early evenings were chosen by the researchers, as well as Saturdays. To ensure that each suburb was evenly sampled, they were alternated between days, and each week so that the same suburb was not sampled always on the same day. On Saturdays, one suburb was sampled in the morning and the other for the afternoon, and this was alternated on different weeks until all data was collected.

Details of participants who agreed to be followed up was documented on a record sheet during the first data collection phase, along with records of street numbers whereby participation was declined or where nobody was home at the time of data collection. Four to

five months later, the participants who agreed to be followed-up were contacted either by phone or email, or for those whom did not leave a phone number or email address, a letter was posted in their mailbox (Appendix D). When contacted, participants were asked if they still agreed to participate in follow-up, and if they consented, a time was arranged to go back to the participant's home and survey them again. Once again, the participant was given an information sheet explaining the study (Appendix E), and before commencing the survey signed a form of their consent (Appendix F). The survey was administered by the researcher in the same order as time 1, firstly the ASDS, followed by the PHQ-9 and then the GAD-7. Some new questions regarding post-traumatic growth, resilience, and acceptance were added, which followed the three scales. Once again, demographic and other single item measures, including those relating to the aftershocks, were last in the survey. Participants were debriefed and thanked at the end of the survey. Ethical approval for this study was obtained from the University of Canterbury Human Ethics Committee before data collection commenced.

CHAPTER THREE

RESULTS

3.1 Descriptive statistics

Table 1 presents the means and standard deviations of total scores on each of the three measures (and the individual subscales of the ASDS) for both suburbs (location), at time 1 and time 2. In terms of the mean total scores for each scale across both suburbs, anxiety and depression were in the mild clinical range (Spitzer et al., 2006; Kroenke et al., 2001; Lowe et al., 2008) at time 1 in the most affected suburb, and both dropped into the non-clinical range by time 2. The relatively unaffected suburb showed no clinical elevation in anxiety and depression at either time point. With regard to acute stress symptoms, mean total ASDS scores at time 1 and 2 did not reach clinically significant levels according to a cut off of 56 proposed by Bryant et al. (2000). However, when using a different ASD classification system proposed by Bryant and Harvey (2000), which suggests ASD is present if 1) at least a score of nine is reached for the dissociation scale, *and* 2) a combined score of at least 28 is reached for the sum of the other three scales, both Mount Pleasant and Cashmere had clinically significant levels of acute stress at time 1. Both dropped into the non-clinical range by time 2.

Table 1

Descriptive statistics for each of the three measures across both location and time

Measure	Location	Time 1 M (SD)	Time 2 M (SD)
Total ASDS	Mt Pleasant	42.37 (15.56)	28.62 (9.03)
		N = 63	N = 63
	Cashmere West	39.77 (14.37)	24.58 (6.74)
		N = 65	N = 65
	Total	41.05 (14.91)	26.57 (8.17)
		N = 128	N = 128
ASDS Dissociation	*Mt Pleasant*	*10.52 (4.35)*	*6.60 (2.69)*
(Total)		*N = 63*	*N = 63*
	Cashmere West	*9.78 (4.57)*	*5.80 (1.55)*
		N = 65	*N = 65*
	Total	*10.15 (4.46)*	*6.60 (2.69)*
		N = 128	*N = 128*
ASDS Intrusions	*Mt Pleasant*	*9.22 (4.11)*	*6.86 (2.41)*
(Total)		*N = 63*	*N = 63*
	Cashmere West	*8.74 (3.34)*	*6.06 (2.19)*
		N = 65	*N = 65*
	Total	*8.98 (3.73)*	*6.45 (2.32)*
		N = 128	*N = 128*
ASDS Avoidance	*Mt Pleasant*	*7.52 (3.29)*	*6.30 (2.85)*
(Total)		*N = 63*	*N = 63*
	Cashmere West	*7.02 (3.56)*	*5.08 (1.99)*
		N = 65	*N = 65*
	Total	*7.27 (3.43)*	*5.68 (2.52)*

(Table 1 continued)

Measure	Location	Time 1 M (SD)	Time 2 M (SD)
		N = 128	*N = 128*
ASDS Arousal	*Mt Pleasant*	*15.10 (5.98)*	*8.86 (3.66)*
(Total)		*N = 63*	*N = 63*
	Cashmere West	*14.23 (5.85)*	*7.65 (2.91)*
		N = 65	*N = 65*
	Total	*14.66 (5.90)*	*8.24 (3.34)*
		N = 128	*N = 128*
Total PHQ-9	Mt Pleasant	5.62 (5.25)	3.43 (7.06)
		N = 63	N = 63
	Cashmere West	4.37 (4.63)	1.46 (3.20)
		N = 65	N = 65
	Total	4.98 (4.96)	2.43 (5.52)
		N = 128	N = 128
Total GAD-7	Mt Pleasant	5.79 (5.12)	2.65 (3.92)
		N = 63	N = 63
	Cashmere West	4.11 (3.62)	1.09 (2.05)
		N = 65	N = 65
	Total	4.94 (4.48)	1.86 (3.20)
		N = 128	N = 128

3.2 Differences between ASDS subscales

In order to determine any significant differences between the four scales of the ASDS, two separate one-way ANOVAs were conducted, one for each time point. Due to differences in the number of items between the four ASDS scales, mean total scores for each scale (i.e., mean of the summed score; shown in table 1) were transformed into means of the mean score (i.e., between 1 and 5 reflecting the response scale). It was identified that at both time 1 and time 2 there was significant variance amongst the mean scores of the four scales of the ASDS, time one $F(1, 127) = 11.117$, $p < 0.001$ and time two $F(1, 127) = 9.901$, $p < 0.001$ respectively. At time 1, the avoidance subscale was the lowest ($M = 1.82$, $SD = 0.86$), with Post-hoc Scheffe tests identifying significant differences between this scale and the arousal ($M = 2.44$, $SD = 0.98$; $p < 0.001$) and re-experiencing ($M = 2.24$, $SD = 0.93$; $p = 0.003$) scales. Additionally, the dissociation scale ($M = 2.03$, $SD = 0.89$) was identified as being significantly lower than the arousal scale ($M = 2.44$, $SD = 0.98$; $p = 0.005$), which had the highest mean score at time 1. At time 2, the dissociation scale ($M = 1.24$, $SD = 0.44$) and the arousal scale ($M = 1.37$, $SD = 0.56$) were found to be significantly lower than the re-experiencing ($M = 1.61$, $SD = 0.58$) scale (dissociation: $p < 0.001$; arousal: $p = 0.008$), which had the highest mean score at this time point.

3.3 Differences across location and time

To assess differences across location and time, 2 (location) by 2 (time) mixed ANOVAs were performed on each dependent variable. In terms of symptoms of acute stress, there was a significant main effect of location, with Mt Pleasant scoring significantly higher on the ASDS than Cashmere West, $F(1, 126) = 4.64$, $p < 0.05$. There was also a significant main effect of time, with a significant decline in ASDS scores between time 1 and

time 2, suggesting reductions in acute stress symptoms over time, $F(1, 126) = 99.86$, $p < 0.0005$. There was no significant interaction between time and location, $F(1, 126) = 0.25$, with participants from both Mt Pleasant and Cashmere West following the same level of decline over time, despite higher scores of acute stress in Mt Pleasant.

A main effect of location was also significant for depression symptoms, with Mt Pleasant again scoring significantly higher than Cashmere West, $F(1, 126) = 6.01$, $p < 0.05$. A significant change from time 1 to time 2 was also observed, with a decline in depression scores, $F(1, 126) = 15.63$, $p < 0.0005$. Once again, an interaction effect was not found, with participants in both suburbs following a similar declining pattern, $F(1, 126) = 0.31$.

A significant main effect of location was also found for anxiety, with Mt Pleasant again scoring significantly higher than Cashmere West, $F(1, 126) = 10.08$, $p < 0.005$. Scores for anxiety also significantly lessened over time F (1,126) = 48.34, $p < 0.0005$, and no interaction between time and group was evident, $F(1, 126) = 0.02$.

3.4 Correlational and regression analyses

In order to identify whether scores on all three measures were associated with the aftershocks, correlational analyses were performed. Using the questions from time 1 of the study "How anxious do these aftershocks make you?" and "How on edge do you feel as a result of the aftershocks?" as well as those from the time 2 "How anxious have the aftershocks made you in the last three months?" and "How on edge do you feel as a result of the aftershocks?" correlations were calculated with total scores on all three scales at both time points. Table 2 presents these correlations. As can be seen, the question "How anxious do these aftershocks make you?" asked at time 1, correlated significantly with scores on all three scales at time one, and at time 2 with scores on the ASDS and the GAD-7, but not on the

measure of depression. The corresponding question at time 2 of the study ("How anxious have the aftershocks made you in the last three months?") significantly correlated with time 2 scores on all three measures. In contrast, the question "How on edge do you feel as a result of the aftershocks?" asked at time 1 correlated significantly with all three measures at time 1, but was associated with only depression symptoms at time 2. When asked at time 2, the same question was found to be significantly associated with all three of the measures at that time.

Stepwise regressions were undertaken to identify how much variance in acute stress, depression, and anxiety symptoms at time two could be explained by aftershock anxiety at time one and two, predictability of response to aftershocks at time one and two, and controllability of this response at time one and two. Aftershock anxiety at time 2 (i.e. anxiety for the aftershocks in the past three months) predicted 21% of the variance in ASDS scores, $R^2 = .21$, $F(1, 123) = 32.97$, $p < 0.001$. The ability to predict ones response to the aftershocks at time two accounted for a further 7% of variance in ASDS scores, $R^2 = .28$, $F(1, 122) = 10.73$, $p = .001$. These results show that those with greater aftershock anxiety and unpredictability of responses to the aftershocks had higher levels of acute stress.

Depression symptoms were found to be less affected by the aftershocks. Specifically, aftershock anxiety at time 2 predicted 7% of the variance in PHQ-9 scores $R^2 = .07$, $F(1, 123) = 9.04$, $p = 0.003$. Other questions related to responses to the aftershocks did not add further to the model.

In terms of anxiety, predictability of response to the aftershocks at time 2 predicted 10% of variance in anxiety scores, $R^2 = .10$, $F(1, 123) = 13.03$, $p < 0.001$. Predictability of responses at time 1 accounted for a further 3% of variance in anxiety scores at time 2, $R^2 = .13$, $F(1, 122) = 4.42$, $p = .038$.

Table 2

Correlations between the three scales and measures and different metrics of aftershock anxiety

	Anx.(T1)	Edge (T1)	ASDS (T1)	PHQ (T1)	GAD (T1)	Anx.(T2)	Edge (T2)	ASDS (T2)	PHQ (T2)	GAD(T2)
Anx. (T1)	-	-	-	-	-	-	-	-	-	-
Edge (T1)	.81**	-	-	-	-	-	-	-	-	-
ASDS (T1)	.63**	.72**	-	-	-	-	-	-	-	-
PHQ (T1)	.49**	.61**	.77**	-	-	-	-	-	-	-
GAD (T1)	.59**	.66**	.78**	.77**	-	-	-	-	-	-
Anx. (T2)	.32**	.19*	.08	.10	.15	-	-	-	-	-
Edge (T2)	.22*	.11	.10	.12	.12	.78**	-	-	-	-
ASDS (T2)	.24**	.08	.09	.06	.10	.47**	.63**	-	-	-
PHQ (T2)	.12	.05	-.03	.04	.06	.26**	.33**	.33**	-	-
GAD (T2)	.24**	.21*	.14	.24**	.19*	.26**	.37**	.55**	.52**	-

Note: * Correlation is significant at the 0.05 level (two-tailed)
** Correlation is significant at the 0.01 level (two-tailed)
T1 = Time one
T2 = Time two
Anx. = refers to the question "How anxious do these aftershocks make you" (or have they made you in the last 3 months for T2)
Edge = refers to the question "How on edge do you feel as a result of the aftershocks?

CHAPTER FOUR

DISCUSSION

The present study was an exploration of the effects of ongoing earthquake aftershocks in the Christchurch region. More specifically, the aim of the study was to identify whether recurring exposure to these natural events leads to an accumulation of symptoms or an habituation effect. In order to do so, measures of generalised anxiety, depression, and acute stress were administered to participants from two suburbs of Christchurch differentially affected by the earthquakes, at two different time points. During the period between data collection points (approximately 5 months), Christchurch was exposed to over 1000 earthquakes, with over 200 a magnitude of three or higher, and 19 of which were significant in size (http://www.geonet.org.nz). Numerous studies have investigated the effects of ongoing exposure to traumatic man-made events such as ongoing terrorist attacks, and have largely identified a pattern of accumulation whereby stress associated with such events builds up over time leading to the development of psychopathological symptoms. However, there is no known research on the effects of ongoing exposure to natural adverse events. It is important to differentiate between symptoms associated with man-made and natural adverse events due to differences in perceived blame and controllability, which can largely affect how one responds to such events.

4.1 Overall findings

Largely, the current study identified a pattern of decline over time. Specifically, participants from both a suburb significantly affected by the earthquakes and a suburb less

affected by the earthquakes were found to decrease in earthquake related symptomology over time, suggesting that as the aftershocks continued, participants learnt to cope adaptively. Although participants from the most damaged suburb, Mount Pleasant, experienced higher levels of symptoms on all three measures at both time points, both suburbs followed a decreasing pattern over time. This suggests that as residents of these suburbs become used to the recurrent aftershocks, symptoms of acute stress, anxiety, and depression decreased. In particular, symptoms of acute stress exhibited the most notable decline. At time 1 of the study, clinically significant levels of acute stress were identified in both suburbs, however over time this decreased dramatically placing symptoms of acute stress below the clinical threshold at time 2. The same pattern was evident for depression and anxiety in the most affected suburb, which started with mild clinical elevations, reducing to a non-clinical level at time 2. Although depression and anxiety symptoms were not clinically significant in the relatively non-affected suburb at either time point, a significant reduction in symptomology was also identified over time for this group.

The findings of the current study contrast with much of the ongoing trauma literature suggesting an accumulation effect over time (Hobfoll et al., 2009; Bleich et al., 2006; Rossman, 2001). That is, after repeated exposure to a feared stimulus, fear structures formed after initial exposure are accessed and supported regularly, placing individuals at a greater risk for maintaining and heightening psychopathological symptoms. Of interest, Diamond et al. (2010) postulate an Ongoing Traumatic Stress Response (OTSR), whereby people exposed to repeated stressors such as terrorist attacks, do not report a specific event marking the onset of symptoms, rather they describe them as gradually increasing over time. In particular, Diamond et al. (2010) propose that these individuals are more likely to experience

avoidance and hyperarousal symptoms, which in fact are adaptive reactions based on reality and fear of future attacks, rather than traumatic memories associated with past attacks.

In the current study, the general pattern of habituation identified over time contrasts substantially with the OTSR postulated by Diamond et al. (2010). However, further analysis of the subscales of the ASDS found that although the avoidance subscale was the lowest of all four at time 1, the hyperarousal scale was significantly higher than the other three scales. Additionally, qualitative information gained by some participants during the survey indicated that for many, symptoms were in fact based on reality and fear of future earthquakes. For example, participants would report avoidance of the topic of earthquakes but largely due to wanting to protect their children, and reported trouble sleeping since the earthquakes started largely due to actual awakening upon their occurrence or hearing loud noises reminiscent of the sound of an earthquake, and failure to get back to sleep afterwards. Likewise, participants would often report being more alert to danger, for example when entering a large building or deciding where to park their car, this too appearing to be an adaptive reaction based on the reality of recurrent earthquakes. However, at time 2, it was identified that participants scored the highest on the re-experiencing scale of the ASDS, suggesting that while symptoms may be largely centred around adaptive reactions based on the reality of recurring earthquakes, traumatic memories associated with previous earthquakes may still be an ongoing problem for residents of Christchurch.

It is important to clarify that all of the known literature supporting an accumulation effect of repeated exposure to trauma, including that by Diamond et al. (2010), has been based on man-made adverse events. A review by Neria et al. (2008) has identified that rates of trauma related symptomology, principally PTSD, are higher in those exposed to man-made adverse events than in those exposed to natural disasters. Several researchers have identified

that it is differences in perceived controllability and blame between natural and man-made disasters that influence rates of post-event psychopathology (Greening et al., 2002; Bodvarsdottir & Elklit, 2004). Specifically, when negative outcomes are attributed to internal, stable, and global causes, which is less likely in the experience of a natural adverse event, the risk for psychopathology, including depression and PTSD, is higher (Greening et al., 2002; Larsen & Fitzgerald, 2010). The habituation effect seen in the current study, which conflicts with much of the previous literature on recurrent exposure to adverse events, could therefore be explained by differences in controllability and blame which may influence adjustment over time.

It is notable, however, that the few studies in the literature surrounding ongoing trauma that have identified a habituation effect were also mostly centred on man-made events (Bleich et al., 2006; Amir & Sol, 1999). The current study, showing a habituation effect of ongoing exposure to natural adverse events over time, is thought to be the first of its kind. Rather than experiencing a build-up of stress associated with the continuous aftershocks and developing significantly more symptomology over time, participants in this study appeared to become accustomed to them and experienced a decline in symptomology over time. Thus for many the aftershocks did not operate as a maintaining factor, but may have operated as a natural therapeutic exposure task, assisting symptom reduction. Yet qualitative information at time 1 suggested that for some participants, it was not the aftershocks that contributed to their symptomology but rather other stressful factors related to the earthquakes, such as house repairs and insurance payouts.

In order to identify whether the decrease in symptomology over time was generally associated with habituation to the aftershocks, correlational and regression analyses were performed. It was found that participants' scores on questions relating to anxiety surrounding

the aftershocks accounted for a moderate amount of variance in acute stress symptoms and a small, but significant amount in depression. Ability to predict response to aftershocks predicted both ASD and anxiety symptoms. Thus aftershock anxiety and inability to predict response to aftershocks impacted significantly on psychological well-being.

It is not surprising that symptoms of acute stress were the most strongly associated with the aftershocks, as a criterion of ASD is that symptoms arise in direct relation to a traumatic or distressing event, such as an earthquake. Aftershocks may act as a trigger to ASD symptoms or may maintain existing symptoms in those with ongoing anxiety. In terms of generalised anxiety, difficulty predicting response to aftershocks may have elevated anxiety about aftershocks occurring. Generalised anxiety symptoms are largely characterised by excessive, uncontrollable, and often irrational worry about everyday things, such as money problems, relationship problems, and work difficulties, as opposed to specific events. Worry associated with the inability to predict response to aftershocks may be a further concern, among many others, associated with everyday difficulties resulting from the earthquakes, such as money problems associated with repairs, and a general increase in stress affecting different aspects of life. In keeping with this, Paranjothy et al. (2011) found in their study of the 2007 UK floods, that generalised anxiety was evident in a considerable amount of those who had damage to their homes and associated insurance difficulties. Paranjothy et al. (2011) also suggest that worries about the effects of the floods on health and personal finances largely increased the likelihood of mental health problems. In the sample used in the current study, problems with insurers and personal finance struggles were common to most of the participants, and it is therefore possible that these factors, compounded by worry predicting aftershock response, contributed to symptoms of generalised anxiety.

Symptoms of depression were only found to be slightly affected by the aftershocks. From participants' reports, it is likely that symptoms of depression were more associated with factors such as loss of livelihood, and grief related to loss of much of one's city. Additionally, some participants reported experiencing lowered mood as a result of spending less time in social interactions due to the closing of many restaurants and bars, and less exercise and outdoor activities due to the closing of many biking and walking tracks as well as swimming pools. In general, regression analyses and qualitative information obtained in the survey suggests that it was not the aftershocks specifically that was leading many residents of these two earthquake affected suburbs to feel depressed.

4.2 Methodological considerations

A number of methodological limitations can be identified in the present study, and may help to explain the substantial differences in findings identified between this and other studies of recurrent exposure to adverse events over time.

4.2.1 Problems with the baseline

Several limitations relate to the baseline measure for symptomology used in the current study. Firstly, data collection was interrupted on several occasions by significant earthquakes, potentially biasing the baseline (time 1). For example, the day data collection was scheduled to begin (13th June 2011), Christchurch was hit by two major earthquakes, one of magnitude 5.89, followed less than an hour and a half later by a magnitude 6.4, with many significant aftershocks occurring in between and for several days afterwards. It was only five days later that data collection began, and it is therefore likely that participants interviewed closer to this date, as opposed to towards the end of time 1 data collection, over a month later, had significantly elevated levels of stress associated with the earthquakes, possibly leading to

an inaccurate baseline measure. In addition, particularly in Mount Pleasant, many residents had left their homes following these June earthquakes and were therefore unavailable for participation in the survey, possibly resulting in an unrepresentative sample of the Mount Pleasant population which will be discussed more below. Throughout the rest of time 1data collection, there were 19 earthquakes of at least a magnitude of 4.0, and it could be that participants interviewed following these earthquakes may have also had higher ratings on the three measures of symptomology. However, due to the nature of the research, this could not be controlled, although an effort was made to refrain from interviewing participants for as long as was thought needed following significant earthquakes.

In contrast to other studies examining the psychological effects of earthquakes, the sample used in the current study had experienced not only one, but at least three significant earthquakes before the baseline measure had even been obtained. Although this study was more so focussed on the effects of continuous adversity in the form of aftershocks, rather than the major earthquake events themselves, it is nevertheless likely that participants were impacted by these large earthquakes. Although questions in the survey allowed participants to report whether or not their symptoms were a result of the continuing aftershocks rather than the large specific earthquakes, it was more often than not reported that symptomology was a result of both. The sample used in the current study may therefore have either a higher or lower baseline than other samples, depending on whether their symptoms had accumulated or declined prior to the baseline measure.

Changes made to the survey from time 1 of data collection to time 2 may also have affected the finding that symptoms decreased over time, and may help to explain why this contrasts so significantly to the findings of other studies. For example, the time frame whereby participants rated their symptoms on all three measures changed from “since the

February earthquake" at time 1, to "in the past week only" at time 2. This allowed an accurate assessment of experiences at time 2, but may have affected the accuracy of the baseline measure. Specifically, at time 1, rather than measuring one's symptoms at that specific time, participants averaged their symptoms over the entire four-five month period that had passed since the February earthquake. It cannot be ruled out that some participants may have reported symptoms they had in the period directly following the February earthquake, but that they may not have experienced in a long time or been experiencing at the time of data collection. Alternatively, participants may have rated their symptoms as they were at their worst. In this case, at time 2, measuring symptom ratings at that particular time (in the last week), it is unsurprising that symptoms were lower, showing an apparent habituation to the aftershocks.

4.2.2 Sample

Another potential limitation of the current study is the sample used. Although the nature of the study does not require that the sample be representative as it is merely examining changes in a group of people over time, certain attributes of the sample may have affected the direction of symptomology over time. For example, the two suburbs used in the current study have some of the highest socioeconomic conditions in Christchurch. Research on samples exposed to adverse events, including earthquakes, has shown that in general, those of higher socioeconomic status are less vulnerable to the psychological effects of such a disaster (Kun et al., 2009; Kumar et al., 2007; Sastry & Van Landingham, 2007; Kilic & Ulosoy, 2003; Chen et al., 2007). Although participants in the current study still showed significantly levels of psychopathology (particularly at time 1), it is likely that their higher socioeconomic status, and likely higher availability of resources, may have positively

affected their ability to adapt over time, resulting in a different direction of symptomology to many other studies.

Additionally, as noted above, many people from the suburbs sampled in the current study, particularly Mount Pleasant, had left their homes as a result of the earthquakes. Previous research comparing those who leave their homes following natural disaster compared to those who stay suggests that those who relocate often have higher levels of symptomology (Blaze & Shwalb, 2009; Kilic et al., 2006; Najarian et al., 2001). Although this could be due to the effects of relocation itself and associated factors, such as loss of social support, the higher symptomology is also likely to reflect higher levels of damage to property, forcing people out of their homes, or higher levels of fear causing people to leave. It is likely, therefore, that the participants in the current study, particularly from Mount Pleasant where many people had left their homes, were not truly representative of the suburb and may have had lower levels of symptomology.

4.3 Implications and future directions

The findings observed in the current study may provide a number of implications for assessment and service provision. Firstly, the finding that symptoms of acute traumatic stress were significantly associated with the recurrent earthquake aftershocks may have implications for the criteria of trauma-related disorders in the future. Criterion A for both ASD and PTSD requires that the event causing the distress must have involved a serious threat of injury or death. Although a natural disaster is constituted as a common precipitant of traumatic stress-related disorders, smaller scale natural adverse events such as the aftershocks associated with an earthquake are unlikely to meet this criterion. However Seides (2010) suggests that repeated exposure to ‘micro-traumas’ or non-life-threatening stressful events

can also precede PTSD symptoms, and may even be more psychologically harmful than a single catastrophic event. In the current study, although over time acute stress symptoms associated with the aftershocks decreased, at time 1 they were present to a clinically significant level, and aftershock anxiety predicted ASD symptoms at time 2. This supports the proposal of Seides (2010) that multiple micro-traumas may have equally substantial effects on psychological health, and future reviews of the criteria for trauma-related disorders should consider this.

Additionally, some of the findings in the current study support the diagnosis of an OTSR postulated by Diamond et al. (2010), despite other findings contradicting this. For example, compared to the other three ASDS scales, the hyperarousal scale was significantly higher at time 1. This scale, as well as the avoidance scale, is suggested by Diamond et al. (2010) to be elevated, compared to the other scales, in the case of OTSR, based on adaptive reactions to reality of recurring events as opposed to traumatic memories associated with those in the past. However, participants in the current study scored the lowest on the avoidance scale at time 1, and additionally, rather than accumulating over time with further exposure as suggested by Diamond et al. (2010), participants in the current study largely reduced in symptomology over time. Additionally, an elevation in the re-experiencing scale at time 2 suggests that although participants in the current study experienced a substantial amount of anxiety surrounding the possibility of future earthquakes, memories associated with previous earthquakes still seemed to be contributing to symptomology. It is recommended that future research in the area addresses the limitations of the current study (such as problems with the baseline and a non-representative sample) which may have lead to these contradictory findings. Although some evidence for OTSR was provided in the current

study, methodological changes in future research may lead to more conclusive evidence to support OTSR.

The findings of the current study, consistent with previous research (Neria et al., 2008; Greening et al., 2002; Bodvarsdottir & Elklit, 2004), largely identify a different symptom trajectory between recurrent man-made and natural adverse events which may have important implications for service provision. Specifically, in the case of ongoing man-made adverse events, such as terrorist attacks, stress-related symptoms have been shown to not only continue over time, but to accumulate (Hobfoll et al., 2009; Bleich et al., 2006; Rossman, 2001), consistent with OTSR. In terms of service provision, this suggests that with man-made events, services should be maintained over time whilst the events are still occurring, and potentially for quite some time afterwards. However in terms of natural recurring events, such as the earthquake aftershocks in this study, whilst treatment services should be implemented heavily in the early stages following the main event, these may be reduced as time passes, even with the occurrence of continuing aftershocks. In the current study, as early as 9-10 months after the event and with the experience of continuing aftershocks, participants' symptomology had decreased dramatically from the clinically significant elevations seen in traumatic stress-related symptoms only 4-5 months earlier.

In terms of treatment models more specifically, the finding that symptoms of acute stress declined with exposure to aftershocks provides further support for an exposure treatment model for traumatic stress-related symptoms, including PTSD. However, the findings of the current study are not conclusive evidence for an exposure therapy model, due to the absence of a control group who were not exposed to the aftershocks. In the current study, it would have been useful to compare those who moved away from Christchurch directly following the February earthquake and therefore who had not experienced

continuous aftershocks, to those residents who had remained in the city. Future research addressing this may help to identify conclusive support for an exposure therapy model of treatment if it is found that those who relocate are worse off in terms of traumatic stress related symptoms. Additionally, this may also provide another implication for residents in disaster stricken areas experiencing a continuation of adversity. Specifically, if future research further supports a negative effect of relocation such as that shown in previous research (Blaze & Shwalb, 2009; Kilic et al., 2006; Najarian et al., 2001), this could provide an important public health message in which residents who are wanting to leave areas exposed to ongoing natural adversity are informed of the potential negative psychological consequences of relocation.

4.4 Conclusions

The current study aimed to identify whether psychological symptoms follow a pattern of accumulation or decline in the context of recurrent natural adverse events, namely the earthquake aftershocks in which the city of Christchurch has been experiencing since September 2010. The results indicate a significant decrease in acute stress, anxiety, and depression symptoms over a period of 4-5 months of exposure to recurring aftershocks, in two differentially affected suburbs. The results of the current study largely support the theory of habituation, whereby, particularly in terms of acute stress, participants learnt to cope with the ongoing aftershocks and experienced a decline in symptomology over time. Differences between the findings of the current study and those examining the effects of recurring man-made adverse events are likely explained by differences in responses, namely perceived controllability and blame, between these event types. However several methodological limitations may further explain the contrast of the findings of the current study with previous

research, including a potentially inaccurate baseline and an unrepresentative sample. Nevertheless, the current study provides important implications for service provision in the context of recurring natural adverse events, as well as to the diagnostic nomenclature of traumatic stress-related disorders.

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APPENDIX A

College of Science

Department of Psychology

Tel: +64 3 364 2902, Fax: + 64 364 2181

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Participant Information sheet

Title: Responses to the February 22nd Canterbury earthquake

Please read the information below which outlines what is involved in this research. If you would like to take part, which will take **approximately 15 minutes**, please sign the consent form below. With your consent we will contact you in 4-5 months to run through the survey again to see how things have changed.

What is the purpose of the Study?

We are trying to understand how people are managing since the February 22nd earthquake, especially those that have been physically affected by it. Data from this study will help understand people's responses to the earthquake.

Do I have to take part?

No. It is up to you to decide whether or not to take part. If you decide to continue, I will ask you some questions about how you have felt since the earthquake and to what degree you were affected by it in terms of what you are thinking and feeling and also whether you had to move from your house at all. It will take approximately 15 minutes to do so.

What will happen to me if I take part?

Should you decide to take part I will ask you a brief set of question about how things have been going for you since the quake.

What do I have to do?

You just simply have to respond to the questions I ask you and if there is any you'd rather not answer, that's fine, we'll skip those ones.

What are the possible disadvantages of taking part?

While you will not be asked to describe any events you may have found distressing, you will be asked whether or not you have had certain experiences and feelings. Some people may find this distressing. A list of support and counselling services is included at the end of this sheet in case you find that helpful.

Will my taking part in the study be kept completely confidential?

Yes. You will not be required to put your name or any identifying details on any materials. All the results will be merged together and a paper may be published, but confidentiality of participants will be preserved.

Contact Details:

If you have any further questions about the study or would like a summary copy of the results once the study is completed, please contact Martin Dorahy, PhD (Senior lecturer; University of Canterbury) on (03) 3643416 or email at martin.dorahy@canterbury.ac.nz.

Names of researchers:

Martin Dorahy (Senior lecturer, University of Canterbury)

Department of Psychology, University of Canterbury, Private Bag 4800, Christchurch, 8140. Phone: 3643416; Email: martin.dorahy@canterbury.ac.nz

Eileen Britt, PhD (Senior Lecturer; University of Canterbury)

Department of Psychology, University of Canterbury, Private Bag 4800, Christchurch, 8140. Phone: 364 2987; Email: eileen.britt@canterbury.ac.nz

Charlotte Renouf (Masters Student, University of Canterbury)

Department of Psychology, University of Canterbury. Phone: 3642987 ext # 3658; Email: charlotte.renouf@pg.canterbury.ac.nz

Helpful Contacts

Support services

Samaritans: 0800 726 666

Lifeline: 0800 353 353; (03) 366 6743

Earthquake counselling helpline: 0800 777 846

Counselling services

Below is a list of counseling services. The Christchurch City Council has also suggested that people make contact with their GPs, who can refer them to free counseling services.

Relationship Services (has offices around Christchurch): 03 366 8804 or 0800 735 283. OFFERING FREE EARTHQUAKE COUNSELLING

Petersgate Counselling Service, Yaldhurst Rd, Upper Riccarton: (03) 343 3391. OFFERING FREE EARTHQUAKE COUNSELLING

Emergency services

Psychiatric Emergency Services: (03) 364 0482

APPENDIX B

College of Science

Department of Psychology

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UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Consent Form

Title of Project: Responses to the February 22nd Canterbury earthquake

Name of researchers:

Martin Dorahy (Clinical Psychologist/Senior lecturer, University of Canterbury); Eileen Britt (Clinical Psychologist/Senior Lecturer, University of Canterbury); Charlotte Renouf (Masters Student, University of Canterbury)

Please initial box

1. I confirm that I have read and understand the information sheet (dated .....) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and my withdrawal will have no negative consequences on me. ☐

3. I understand that my participation is confidential, i.e., that any information provided by me is confidential, and I will not give any identifying information. ☐

4. I agree to take part in the following study ☐

5. I consent that my data be merged with all the other data ☐

_____ _____ _____

Name of Participant Signature Date

_____ _____ _____

Researcher/clinician Signature Date

6. I consent to be contacted again in 4-5 months to do the survey again

_____ _____ _____

Name of Participant Signature Date

Contact details:_____

This project has been reviewed and approved by the University of Canterbury Human Ethics.

APPENDIX C

Participant Survey (Time one)

ASDS

Please answer each of these questions about how you have felt since the earthquake occurred on Feb 22nd.

		Not at all	Mildly	Medium	Quite a bit	Very much
1	Since the earthquake in Feb, have you ever felt numb or distant from your emotions?	1	2	3	4	5
2	During or after the earthquakes, did you ever feel in a daze?	1	2	3	4	5
3	During or after the earthquakes, did things around you ever feel unreal or dreamlike?	1	2	3	4	5
4	During or after the earthquakes, did you ever feel distant from your normal self or like you were watching things happen from outside?	1	2	3	4	5
5	Have you been unable to recall important aspects of the earthquakes?	1	2	3	4	5
6	Have memories of the earthquakes kept entering your mind?	1	2	3	4	5
7	Have you had bad dreams or nightmares about them?	1	2	3	4	5
8	Have you felt as if earthquakes were about to happen again?	1	2	3	4	5
9	Do you feel very upset when you are reminded of earthquakes?	1	2	3	4	5
10	Have you tried not to think about the earthquakes?	1	2	3	4	5
11	Have you tried not to talk about the earthquakes?	1	2	3	4	5
12	Have you tried to avoid situations or people that remind you of the earthquakes?	1	2	3	4	5
13	Have you tried not to feel upset or distressed about the earthquakes?	1	2	3	4	5
14	Have you had trouble sleeping since the earthquakes started?	1	2	3	4	5
15	Have you felt more irritable since they started?	1	2	3	4	5
16	Have you had difficulty concentrating since they started?	1	2	3	4	5
17	Have you become more alert to danger since they	1	2	3	4	5

	started?					
18	Have you become jumpy since they started?	1	2	3	4	5
19	When you are reminded of the earthquakes, do you sweat or tremble or does your heart beat fast?	1	2	3	4	5

*** Do you feel that any difficulties you reported above are the result of the aftershocks rather than the Feb 22nd earthquake?**

Not at all a little somewhat quite a lot completely

* **Were these difficulties present following the September earthquake?**

No Yes & made worst by Feb quake Yes & no worse since Feb quake

PHQ-9

Since the Feb. earthquake, how often have you been bothered by the following problems?	**Not at all**	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

*** Do you feel that any difficulties you reported above are the result of the aftershocks rather than the Feb 22nd earthquake?**

Not at all a little somewhat quite a lot completely

* **Were these difficulties present following the September earthquake?**

No Yes & made worst by Feb quake Yes & no worse since Feb quake

GAD-7

Since the Feb. earthquake, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

* **Were these difficulties present following the September earthquake?**

No Yes & made worst by Feb quake Yes & no worse since Feb quake

*** Do you feel that any difficulties you reported above are mostly the result of the aftershocks rather than the 22nd Feb earthquake?**

Not at all a little somewhat quite a lot completely

If you checked any problems above (all 3 questionnaires), how difficult have these made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	**Somewhat difficult**	**Very difficult**	**Extremely difficult**

*** To what degree has your alcohol intake increased since Feb 22nd?** NA
Not at all a little Somewhat Quite a lot a significant amount

*** To what degree has your cigarette use increased since Feb 22nd?** NA
Not at all a little Somewhat Quite a lot a significant amount

*** To what degree has your recreational drug use increased since Feb 22nd?** NA
Not at all a little Somewhat Quite a lot a significant amount

*** Have you started medication for stress, low mood or anxiety since Feb 22nd?** No Yes

***As a result of the earthquake and/or the aftershocks, did you:**
* Have to move from your house No Yes
* Live for more than 2 days without water, electricity or sewage No Yes
* Did you know anyone killed or seriously injured (hospitalised)? _____

* Have you lost anything as a result of the quakes? (home, job, business, family member)
_____

Age_____ Gender_____

***Due to the Feb 22nd quake, have you sought help from health services?** (circle): 1. GP, 2. ACC, 3. Government Helpline, 4. Healthline, 5. counselling, 6. psychologist, 7. Other_____

*If 'no', Why not? 1. Not needed, 2. (Please state)*_____

*** Due to the Feb 22nd quake, have you sought assistance from social services?** (circle) 1. WINZ (e.g., sickness, unemployment benefit, emergency grant), 2. Government Helpline, 3. EQC, 4. ChCh City Council customer service (e.g., road, waste, sewage, 4. Other_____

*If 'no', Why not? 1. Not needed, 2. (please state)*_____

***Since the earthquake, how on edge have you felt?**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Constantly

***How anxious do these aftershocks make you?**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

***How on edge do you feel as a result of the aftershocks?**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

***How well can you predict the response you will have to each aftershock?**

Completely 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Not at all

***How much do you believe you can control your response to these aftershocks?**

Completely 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Not at all

*** Since the earthquake and ongoing aftershocks, has there been more tension within your family (e.g., people's relationships have become more frayed)**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

***Since the earthquake, how much disruption have you experienced in:**

	NA	Not at all	Some	Moderate	A lot	Extreme
Work outside the home	0	1	2	3	4	5
Household tasks	0	1	2	3	4	5
Social and leisure activities	0	1	2	3	4	5
Family Unit	0	1	2	3	4	5
Relationship with partner	0	1	2	3	4	5
Relationship with children	0	1	2	3	4	5
Relationship with extended family/friends	0	1	2	3	4	5

*** Since the earthquake, have you been concerned about the emotional well-being of someone in your house?**

No Yes (specify)_____

*** Have you got people around that you can talk to about your experiences during and since the earthquake?**

0 (Not at all) 1 (occasionally) 2 (sometimes) 3 (often) 4 (Constantly)

APPENDIX D

College of Science

Department of Psychology
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Email: office@psychology.ac.nz www.psyc.canterbury.ac.nz

(Date)

Dear participant,

You may remember that approximately 3-4 months ago I visited your home asking questions as part of a study being done throughout Christchurch by the University of Canterbury on peoples' psychological well-being since the February earthquake. At that stage I asked you about the possibility of you completing the survey again and you were agreeable. This will allow us to better understand the well-being of people in Christchurch as time goes on since the quakes started.

If you are still agreeable to me visiting you again to complete the 15-20 minute survey, that would be greatly appreciated. I will be in your area over the next few weeks and if you would like to suggest an approximate time of day which suits you best, I will pop around briefly.

If you have any further questions, please do not hesitate to contact me or my supervisors (details below).

Many thanks,

Charlotte Renouf

Masters Student
Dept of Psychology
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APPENDIX E

College of Science

Department of Psychology

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UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Participant Information sheet

Title: Responses to the February 22nd Canterbury earthquake: A follow-up study

Approximately 3-4 months ago you completed a survey about how you were feeling following the February 22nd earthquake. At that point you agree to be contacted to complete the survey again to see how things are going for you now. Please read the information below which outlines what is involved in this follow-up research. If you would like to take part, which will again take **approximately 15 minutes**, please sign the consent form below.

What is the purpose of the Study?

We are trying to understand how people are managing since the February 22nd earthquake, especially those that have been physically affected by it. Data from this study will help understand people's responses to the earthquake and in what way things change over time.

Do I have to take part?

No. Even though you agreed to us contacting you several months ago, you do not have to take part in this study. It is up to you to decide whether or not to take part. If you decide to continue, I will ask you some questions about how you have felt since the earthquake and to what degree you were affected by it in terms of your psychological well-being. You are free to withdraw at any point. It will take approximately 15 minutes to complete the survey.

What will happen to me if I take part?

Should you decide to take part I will ask you a brief set of questions about how things have been going for you as a result of the quakes.

What do I have to do?

You just simply have to respond to the questions I ask you and if there is any you'd rather not answer, that's fine, we'll skip those ones.

What are the possible disadvantages of taking part?

While you will not be asked to describe any events you may have found distressing, you will be asked whether or not you have had certain experiences and feelings. Some people may find this distressing. A list of support and counselling services is included on this sheet in case you find these helpful.

Will my taking part in the study be kept completely confidential?

Yes. You will not be required to put your name or any identifying details on any materials. All the results will be merged together and a paper may be published, but confidentiality of participants will be preserved.

Contact Details:

If you have any further questions about the study or would like a summary copy of the results once the study is completed, please contact Martin Dorahy, PhD (Senior lecturer; University of Canterbury) on (03) 3643416 or email at martin.dorahy@canterbury.ac.nz.

Name of researchers:

Martin Dorahy (Senior lecturer, University of Canterbury)

Department of Psychology, University of Canterbury, Private Bag 4800, Christchurch, 8140. Phone: 3643416; Email: martin.dorahy@canterbury.ac.nz

Eileen Britt, PhD (Senior Lecturer; University of Canterbury)

Department of Psychology, University of Canterbury, Private Bag 4800, Christchurch, 8140. Phone: 364 2987; Email: eileen.britt@canterbury.ac.nz

Charlotte Renouf (Masters Student, University of Canterbury)

Department of Psychology, University of Canterbury. Phone: 3642987 ext # 3658; Email: charlotte.renouf@pg.canterbury.ac.nz

Helpful Contacts

Support services

Samaritans: 0800 726 666

Lifeline: 0800 353 353; (03) 366 6743

Earthquake counselling helpline: 0800 777 846

Counselling services

Below is a list of counseling services. The Christchurch City Council has also suggested that people make contact with their GPs, who can refer them to free counseling services.

Relationship Services (has offices around Christchurch): 03 366 8804 or 0800 735 283. OFFERING FREE EARTHQUAKE COUNSELLING

Petersgate Counselling Service, Yaldhurst Rd, Upper Riccarton: (03) 343 3391. OFFERING FREE EARTHQUAKE COUNSELLING

Emergency services

Psychiatric Emergency Services: (03) 364 0482

APPENDIX F

College of Science

Department of Psychology

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UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Consent Form

Title of Project:

Responses to the February 22nd Canterbury earthquake: A follow-up study

Name of researchers:

Martin Dorahy (Clinical Psychologist/Senior lecturer, University of Canterbury); Eileen Britt (Clinical Psychologist/Senior Lecturer, University of Canterbury); Charlotte Renouf (Masters Student, University of Canterbury)

Please initial box

1. I confirm that I have read and understand the information sheet (dated .....) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and my withdrawal will have no negative consequences on me. ☐

3. I understand that my participation is confidential, i.e., that any information provided by me is confidential, and I will not give any identifying information ☐

4. I agree to take part in the following study ☐

5. I consent that my data be merged with all the other data ☐

_____ _____ _____

Name of Participant Signature Date

_____ _____ _____

Researcher/clinician Signature Date

6. I consent to being contacted again in the future to do the survey again

_____ _____ _____

Name of Participant Signature Date

Contact details:_____

This project has been reviewed and approved by the University of Canterbury Human Ethics.

APPENDIX G

Participant survey (time two)

ASDS

Please answer each of these questions about how you have felt **in the past week** as a result of the earthquakes.

		Not at all	Mildly	Medium	Quite a bit	Very much
1	Have you ever felt numb or distant from your emotions?	1	2	3	4	5
2	Have you ever felt in a daze?	1	2	3	4	5
3	Have things around you ever felt unreal or dreamlike?	1	2	3	4	5
4	Have you ever felt distant from your normal self or like you were watching things happen from outside?	1	2	3	4	5
5	Have you been unable to recall important aspects of the earthquakes?	1	2	3	4	5
6	Have memories of the earthquakes kept entering your mind?	1	2	3	4	5
7	Have you had bad dreams or nightmares about them?	1	2	3	4	5
8	Have you felt as if earthquakes were about to happen again?	1	2	3	4	5
9	Have you felt very upset when you are reminded of earthquakes?	1	2	3	4	5
10	Have you tried not to think about the earthquakes?	1	2	3	4	5
11	Have you tried not to talk about the earthquakes?	1	2	3	4	5
12	Have you tried to avoid situations or people that remind you of the earthquakes?	1	2	3	4	5
13	Have you tried not to feel upset or distressed about the earthquakes?	1	2	3	4	5
14	Have you had trouble sleeping?	1	2	3	4	5
15	Have you felt irritable?	1	2	3	4	5
16	Have you had difficulty concentrating?	1	2	3	4	5
17	Have you been overly alert to danger?	1	2	3	4	5
18	Have you been jumpy?	1	2	3	4	5

19	When you are reminded of the earthquakes, do you sweat or tremble or does your heart beat faster?	1	2	3	4	5

* **Have you experienced distressing events in the past that have lead to you experiencing any of these difficulties before the earthquakes started?**

No Yes & worse after EQs Yes & better after EQs Yes & no worse or better after quakes

*** Do you feel that any difficulties you reported above are the result of the continuing aftershocks rather than the large specific earthquakes (e.g., Sept, Feb, June)?**

Not at all a little somewhat quite a lot completely

PHQ-9

In the *past week*, as a result of the earthquakes, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

* **Were these difficulties present before the earthquakes started (i.e., before Sept 2010)?**

No Yes & made worst by EQs Yes & no worse since EQs Yes & better since EQs

*** Do you feel that any difficulties you reported above are the result of the continuing aftershocks rather than the large specific earthquakes (e.g., September, February, June)?**

Not at all a little somewhat quite a lot completely

In the *past week*, as a result of the earthquakes, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

GAD-7

* **Were these difficulties present before the earthquakes started (i.e., before Sept 2010)?**

No Yes & made worst by EQs Yes & no worse since EQs Yes & better since EQs

*** Do you feel that any difficulties you reported above are the result of the continuing aftershocks rather than the large specific earthquakes (e.g., September, February, June)?**

Not at all a little somewhat quite a lot completely

If you checked <u>any</u> problems above (all 3 questionnaires), how <u>difficult</u> have these made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all Somewhat difficult Very difficult Extremely difficult

*** Before the EQs were you the type of person who was able to adapt to change?**				
0 (not at all true)	1	2	3	4 (always true)
*** Before the EQs were you the type of person who tended to bounce back from illness and hardship?**				
0 (not at all true)	1	2	3	4 (always true)
*** Have these abilities (adapt to change/bounce back) changed since the EQs started?**				
No	Yes & w EQs	Yes & no worse since EQs	Yes & better since EQs	
***As a result of the EQs:**				
Have you developed a greater appreciation for the value of your own life?				
No	Very small degree	Small degree	Moderate degree	Great degree	Very great degree
Have you developed a greater sense of closeness with others?				
No	Very small degree	Small degree	Moderate degree	Great degree	Very great degree
Have you discovered that you're stronger than you thought you were?				

No	Very small degree	Small degree	Moderate degree	Great degree	Very great degree

***To what extent is each item below characteristic of you?**

Unforeseen events upset me greatly

1 (not at all) 2 3 (somewhat) 4 5 (Entirely)

I always want to know what the future has in store for me

1 (not at all) 2 3 (somewhat) 4 5 (Entirely)

When I am uncertain, I can't function very well

1 (not at all) 2 3 (somewhat) 4 5 (Entirely)

***Which EQ affected you the most: Sept Boxing day February June Aftershocks Other____**

*** To what degree has your alcohol intake changed in the last 3 months?** NA

Reduced Not at all ↑a little ↑Somewhat ↑Quite a lot ↑a significant amount

*** To what degree has your cigarette use increased in the last 3 months?** NA

Reduced Not at all ↑a little ↑Somewhat ↑Quite a lot ↑a significant amount

*** To what degree has your recreational drug use increased in the last 3 months?** NA

Reduced Not at all ↑a little ↑Somewhat ↑Quite a lot ↑a significant amount

*** Have you started medication for stress, low mood or anxiety in the last 3 months?** No Yes

*** Have you lost anything <u>in the last 3 months</u> as a result of the EQs? (home, job, business, family member) _____**

Age_____ Gender_____

***In the past 3 months, as a result of the EQs, have you sought help from health services?**

(circle): 1. GP, 2. ACC, 3. Government Helpline, 4. Healthline, 5. counselling, 6. psychologist, 7. Other_____

If 'no', Why not? 1. Not needed, 2. (please state)_____

*** In the past 3 months, as a result of the EQs, have you sought assistance from social services?**

(circle) 1. WINZ (e.g., sickness, unemployment benefit, emergency grant), 2. Government Helpline, 3. EQC, 4. ChCh City Council customer service (e.g., road, waste, sewage), 4. Other_____

If 'no', Why not? 1. Not needed, 2. (please state)_____

* **In the past 3 months, as a result of the EQs, how on edge have you felt?**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Constantly

***How anxious have aftershocks made you in the last 3 months?**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

***How on edge do you feel as a result of the aftershocks?**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

***How well can you predict the response you will have to each aftershock?**

Completely 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Not at all

***How much do you believe you can control your response to aftershocks?**

Completely 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Not at all

*** In the past 3 months, as a result of the EQs, has there been more tension within your family (e.g., people's relationships have become more frayed)**

Not at all 0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

*** Thinking about yourself since the EQs started and how you normally feel, to what extent do you generally feel:**

Upset	Hostile	Alert	Ashamed	Inspired	Nervous	Determined	Attentive	Afraid	Active
(Never) 1			2		3		4	5 (always)	

* **In the past 3 months, as a result of the EQs, how much disruption have you experienced in:**

	NA	Not at all	Some	Moderate	A lot	Extreme
Work outside the home	0	1	2	3	4	5
Household tasks	0	1	2	3	4	5
Social and leisure activities	0	1	2	3	4	5
Family Unit	0	1	2	3	4	5
Relationship with partner	0	1	2	3	4	5
Relationship with children	0	1	2	3	4	5
Relationship with extended family/friends	0	1	2	3	4	5

*** In the past 3 months, as a result of the EQs, have you been concerned about the emotional well-being of someone in your house?**

No Yes (specify)_____

*** Have you got people around that you can talk to about your experiences (including concerns) since the earthquake?**

0 (Not at all) 1 (occasionally) 2 (sometimes) 3 (often) 4 (Constantly)

APPENDIX H

Small Steps Forward To Get Back Into Everyday Life After The Earthquake

It is normal to feel scared and nervous about everyday things after an earthquake, but gradually returning to old places and activities is important.

Here are 10 small steps that can help:

Pick one place or activity you want to get back to

Break down the job of getting back into small steps

Take one step at a time and be patient with yourself

Breathe slowly on each step

Stay on the same step until it is easier

Go back a step if it's too hard

It is important to take a step often

Ask others for support to take steps

Notice how far you have come

Give yourself a pat on the back!

<u>Here are small steps that could be taken over a number of days to go back into a building</u>

Go to the building car park
Walk to the building door
Go into the building entrance
Stay on the same level and go further into the building
Gradually go to parts of the building you find more challenging

Christchurch Earthquake
Taking care of yourself

Routines 'Familiarity is comforting'

Keep up normal activities
Treasure familiar things

Stay connected 'We need each other'

Stay in touch with family and friends
Take moments to give others your full attention
Listen and answer children's questions simply
Be brave for each other
Ask for and accept help

Save your energy 'Keep it for important things'

Lower expectations of yourself and others
Take breaks and lighten your workload
Be tolerant of yourself and others
Lots of things can wait
Children may act younger – that's ok for a while

Lifestyle 'Balance is healthy'

Stay active e.g. go for a walk
Relax - take a break
Limit alcohol
Try to get enough sleep
Try to eat well
Do something nice for yourself

Safety 'Protect yourself in every way'

Limit exposure to earthquake news e.g. TV
You are not helpless – remember the things you do well
Take care of your spiritual and emotional health
It is ok to be emotional

For extra support contact your GP, or phone 0800 777 846, or go to
www.canterburyearthquake.org.nz